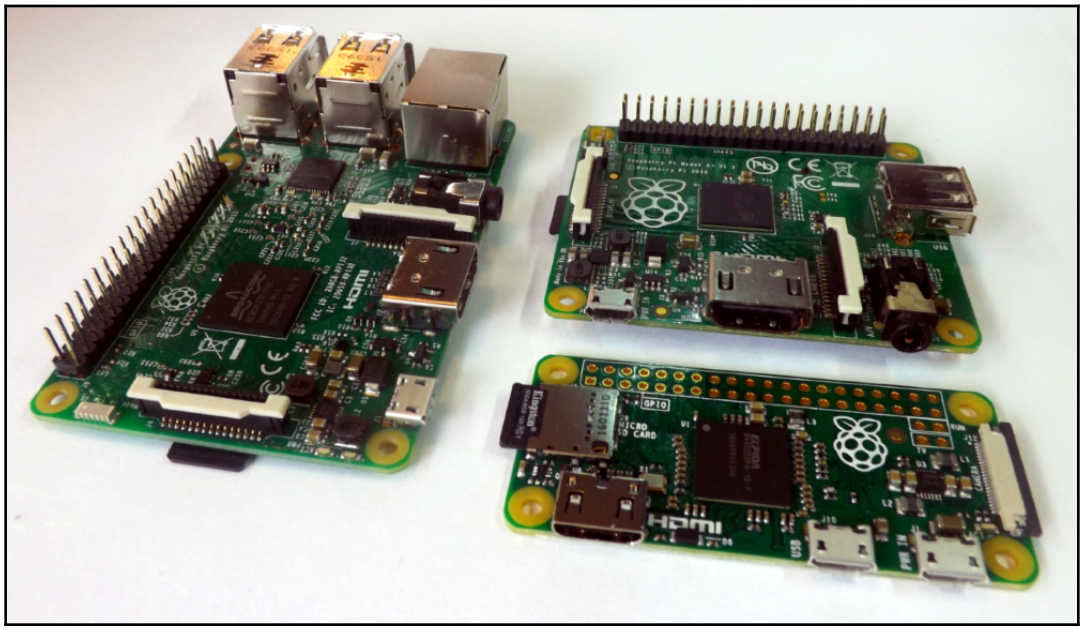
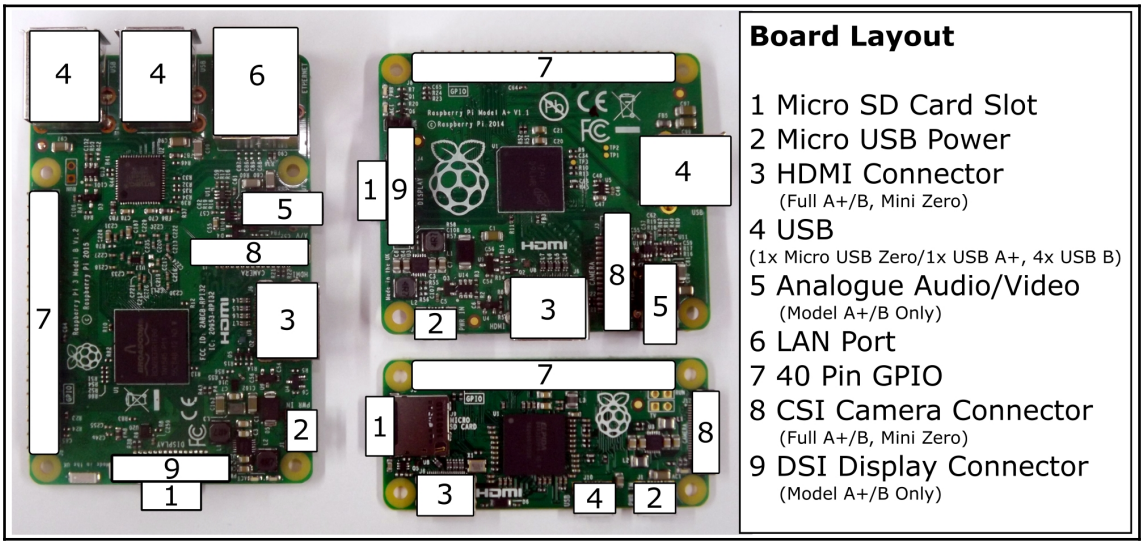
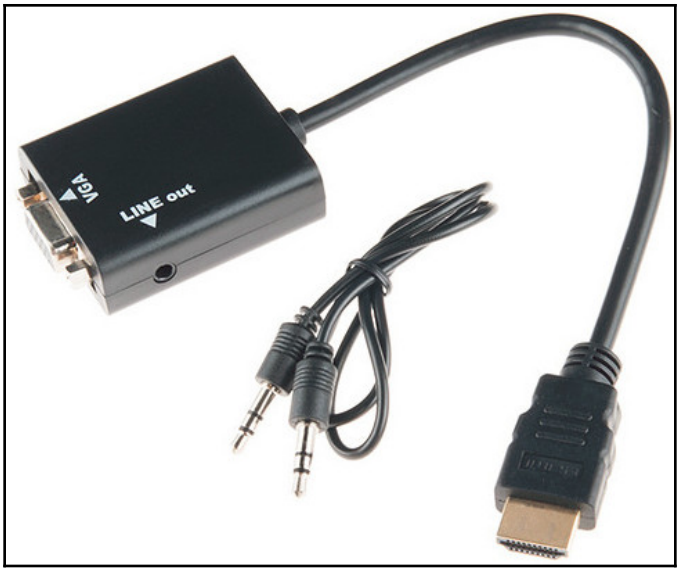
Chapter 1: Getting Started with a Raspberry Pi 3 Computer

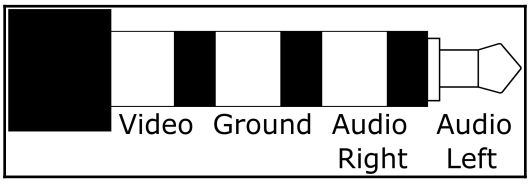


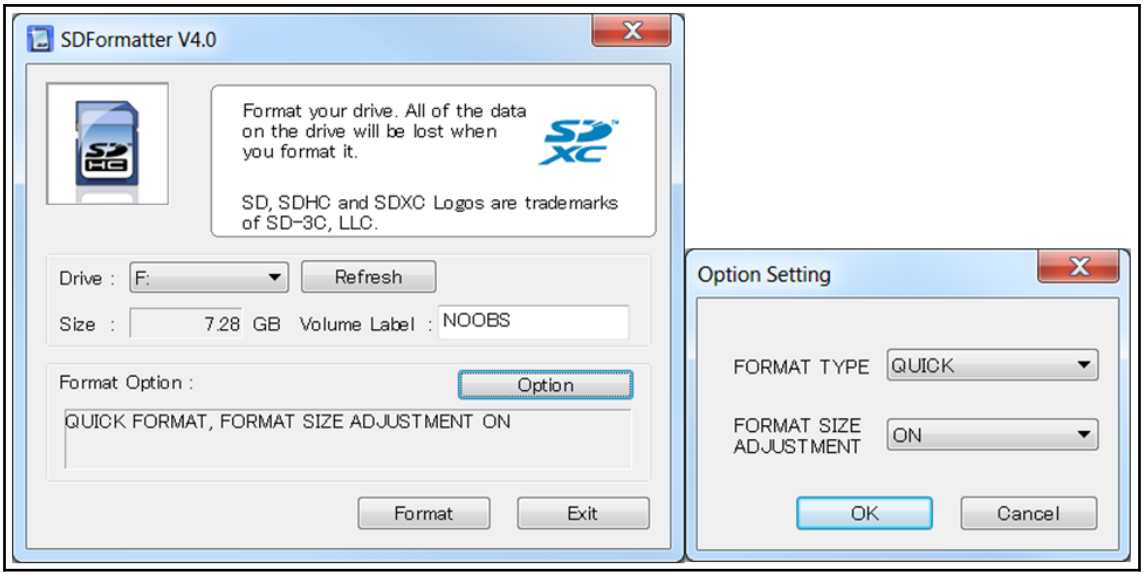


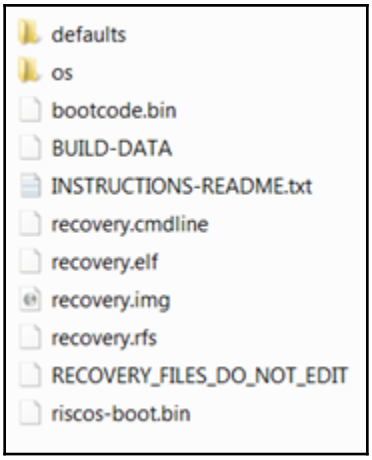
Board Layout

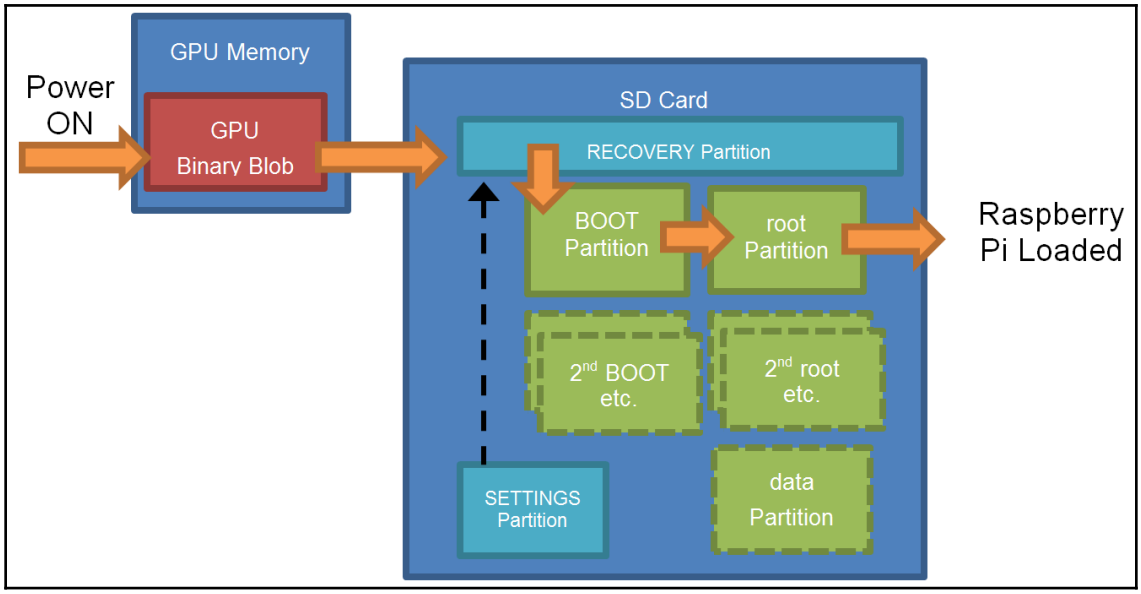
1 Micro SD Card Slot
2 Micro USB Power
3 HDMI Connector
(Full A+/B, Mini Zero)
4 USB
(1x Micro USB Zero/1x USB A+, 4x USB B)
5 Analogue Audio/Video
(Model A+/B Only)
6 LAN Port
7 40 Pin GPIO
8 CSI Camera Connector
(Full A+/B, Mini Zero)
9 DSI Display Connector
(Model A+/B Only)

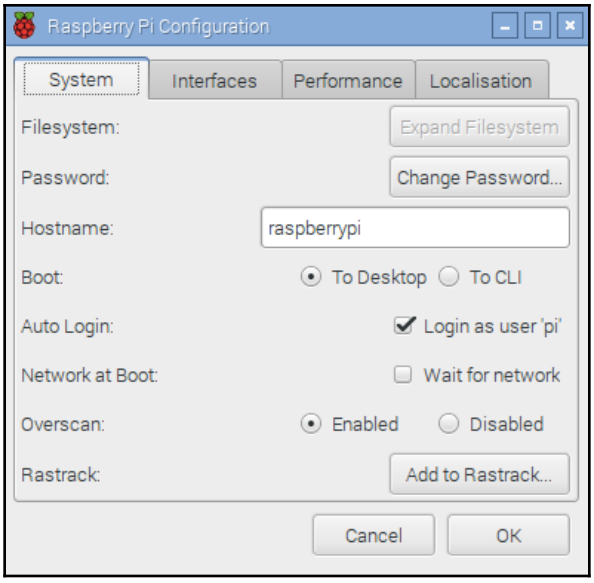

VGA
LINE out


Video
Ground
Audio Right
Audio Left

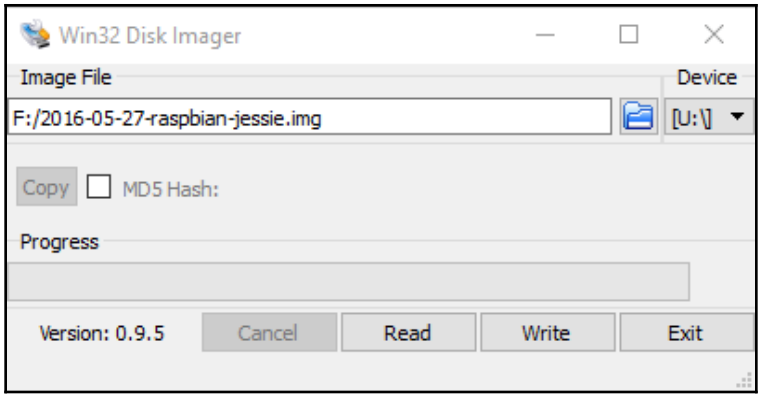

SDFormatter V4.0
Format your drive. All of the data on the drive will be lost when you format it.
SD, SDHC and SDXC Logos are trademarks of SD-3C, LLC.
Drive : F:
Refresh
Size : 7.28 GB
Volume Label : NOOBS
Format Option :
Option
QUICK FORMAT, FORMAT SIZE ADJUSTMENT ON
Format
Exit
Option Setting
FORMAT TYPE
QUICK
FORMAT SIZE ADJUSTMENT
ON
OK
Cancel

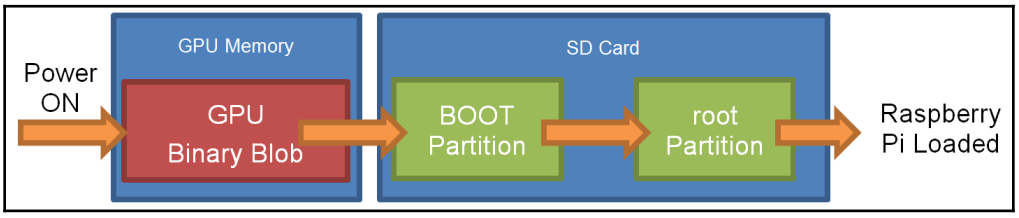

defaults
os
bootcode.bin
BUILD-DATA
INSTRUCTIONS-README.txt
recovery.cmdline
recovery.elf
recovery.img
recovery.rfs
RECOVERY_FILES_DO_NOT_EDIT
riscos-boot.bin

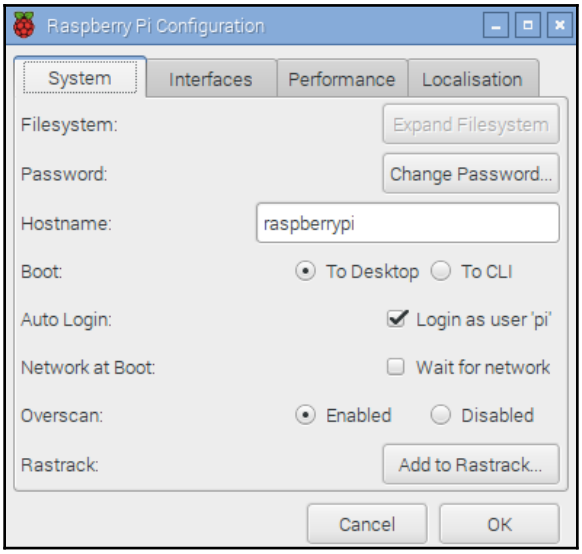

Power
ON
GPU Memory
GPU
Binary Blob
SD Card
RECOVERY Partition
BOOT
Partition
root
Partition
2nd BOOT
etc.
2nd root
etc.
SETTINGS
Partition
data
Partition
Raspberry
Pi Loaded


Raspberry Pi Configuration
System
Interfaces
Performance
Localisation
Filesystem:
Expand Filesystem
Password:
Change Password...
Hostname:
raspberrypi
Boot:
To Desktop
To CLI
Auto Login:
Login as user 'pi'
Network at Boot:
Wait for network
Overscan:
Enabled
Disabled
Rastrack:
Add to Rastrack...
Cancel
OK

```
pi@raspberrypi ~ $ passwd
Changing password for pi.
(current) UNIX password:
Enter new UNIX password:
Retype new UNIX password:
passwd: password updated successfully
```

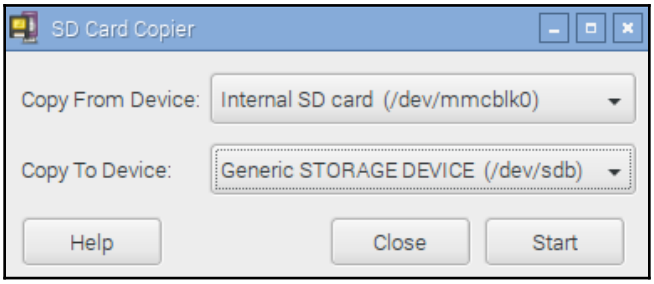


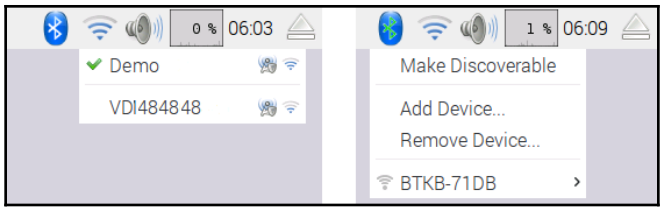


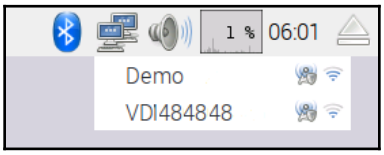


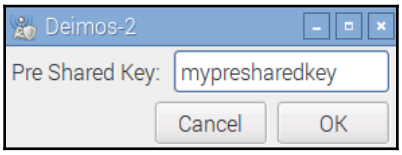

```
pi@raspberrypi:~ $ df
Filesystem     1K-blocks    Used Available Use% Mounted on
/dev/root        5964864 3554020   2084804  64% /
devtmpfs          469544       0    469544   0% /dev
tmpfs             473880       0    473880   0% /dev/shm
tmpfs             473880    6460    467420   2% /run
tmpfs               5120       4      5116   1% /run/lock
tmpfs             473880       0    473880   0% /sys/fs/cgroup
/dev/mmcblk0p6     64366   20442     43924  32% /boot
tmpfs              94776       0     94776   0% /run/user/1000
/dev/mmcblk0p5     30701     398     28010   2% /media/pi/SETTINGS
pi@raspberrypi:~ $
```

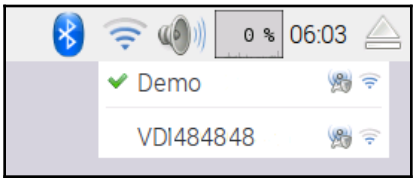
```
Device         Boot   Start      End  Sectors  Size Id Type
/dev/mmcblk0p1         8192  2541015  2532824  1.2G  e W95 FAT16 (LBA)
/dev/mmcblk0p2      2541016 15130623 12589608    6G  5 Extended
/dev/mmcblk0p5      2547712  2613245    65534   32M 83 Linux
/dev/mmcblk0p6      2613248  2742271   129024   63M  c W95 FAT32 (LBA)
/dev/mmcblk0p7      2744320 15130623 12386304  5.9G 83 Linux
```

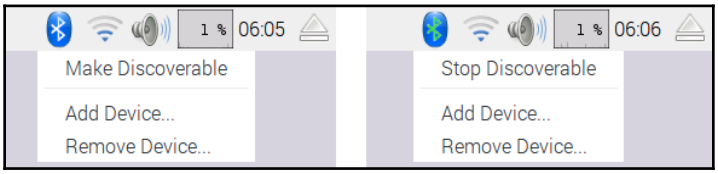

SD Card Copier
Copy From Device:
Internal SD card (/dev/mmcblk0)
Copy To Device:
Generic STORAGE DEVICE (/dev/sdb)
Help
Close
Start

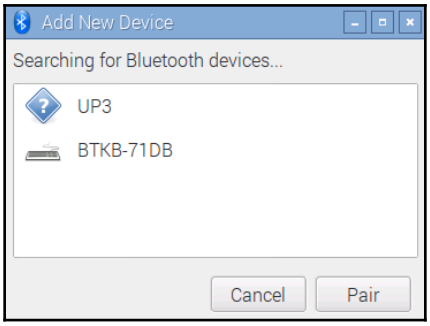

0 %
06:03
Demo
VDI484848
1 %
06:09
Make Discoverable
Add Device...
Remove Device...
BTKB-71DB

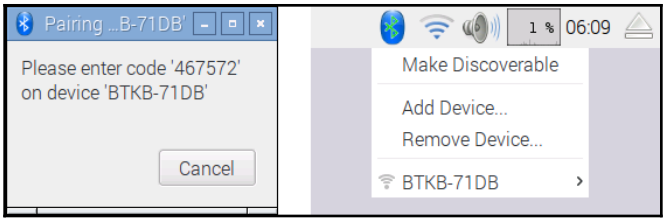

1 %
06:01
Demo
VDI484848

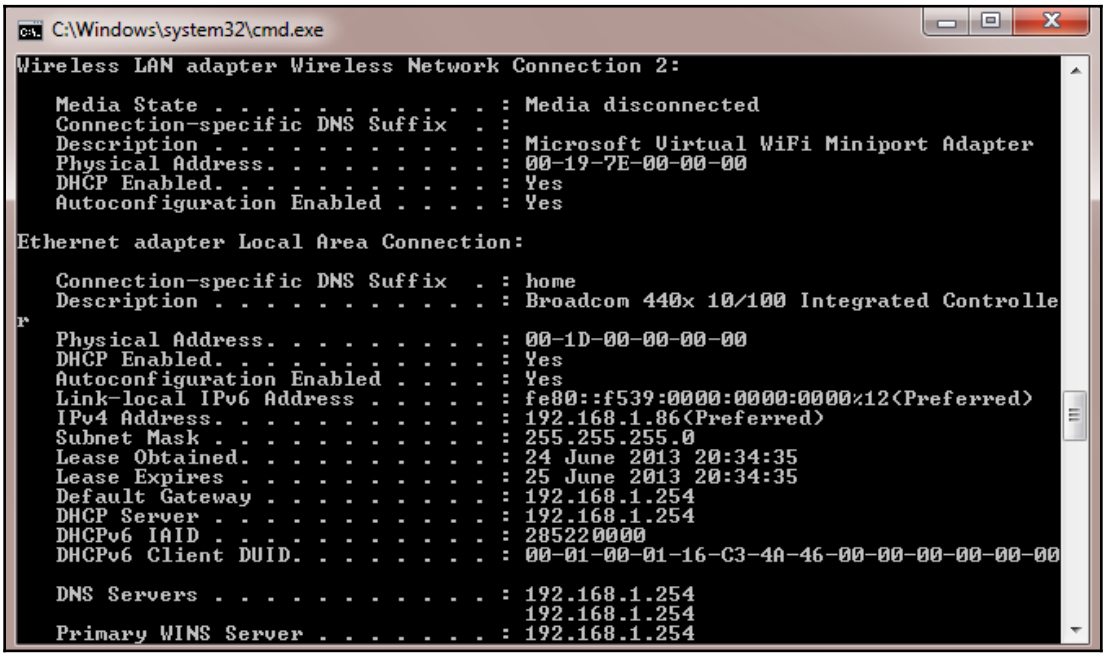

Deimos-2
Pre Shared Key:
mypresharedkey
Cancel
OK

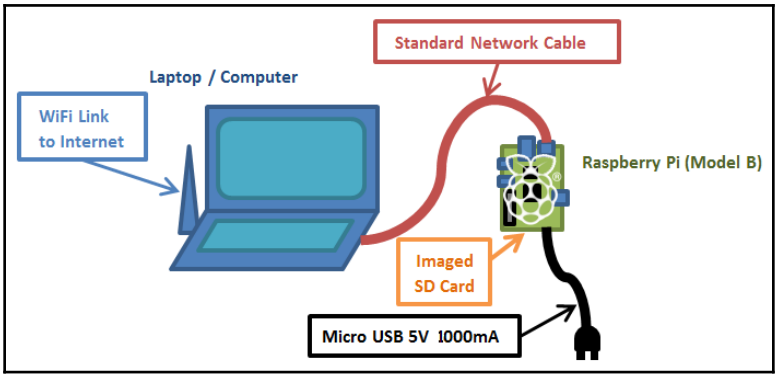

0 %
06:03
Demo
VDI484848

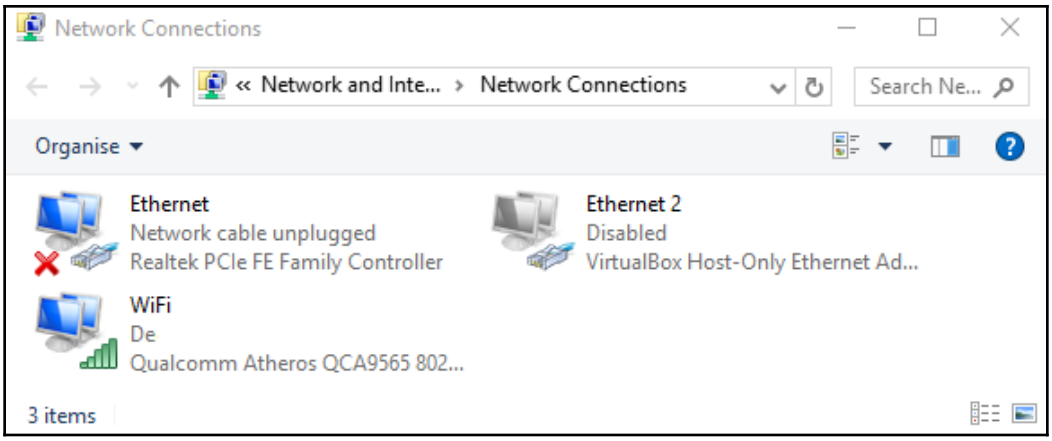

1 %
06:05
Make Discoverable
Add Device...
Remove Device...
1 %
06:06
Stop Discoverable
Add Device...
Remove Device...

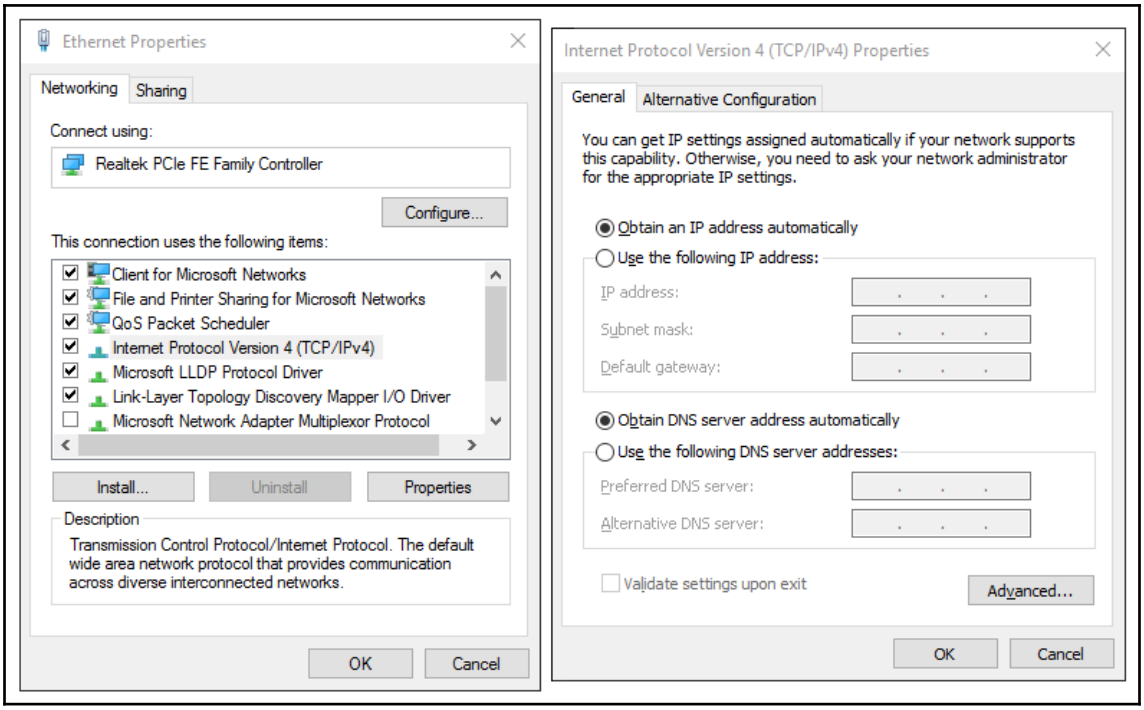

Add New Device
Searching for Bluetooth devices...
UP3
BTKB-71DB
Cancel
Pair

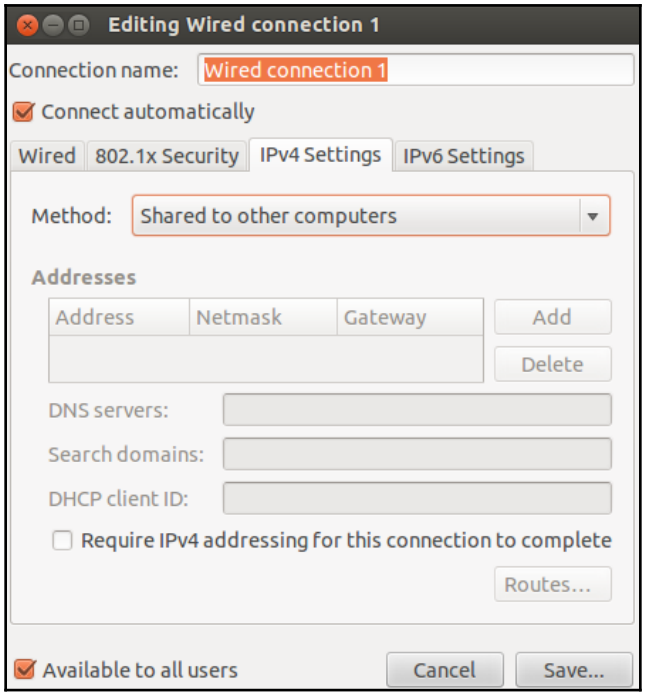

Pairing ...B-71DB'
Please enter code '467572'
on device 'BTKB-71DB'
Cancel
1 %
06:09
Make Discoverable
Add Device...
Remove Device...
BTKB-71DB

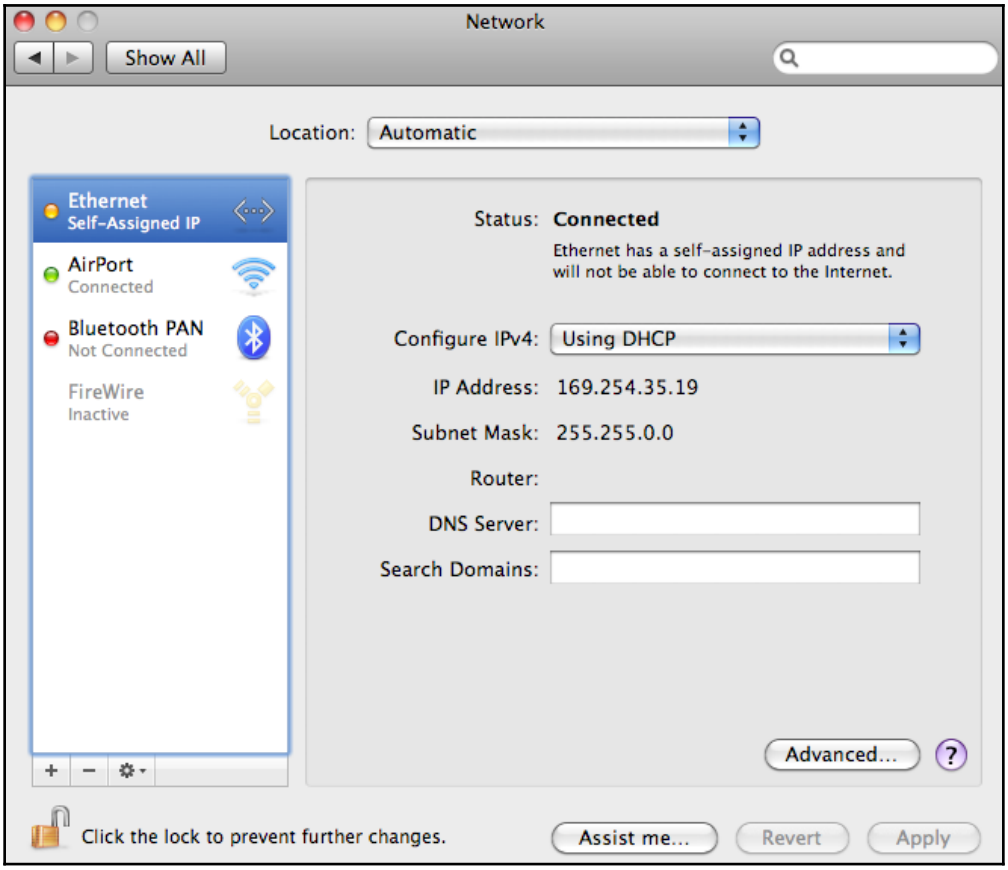

C:\Windows\system32\cmd.exe
Wireless LAN adapter Wireless Network Connection 2:
Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . :
Description . . . . . : Microsoft Virtual WiFi Miniport Adapter
Physical Address. . . . . : 00-19-7E-00-00-00
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Ethernet adapter Local Area Connection:
Connection-specific DNS Suffix . : home
Description . . . . . : Broadcom 440x 10/100 Integrated Controlle
r
Physical Address. . . . . : 00-1D-00-00-00-00
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::f539:0000:0000:0000%12(Preferred)
IPv4 Address. . . . . : 192.168.1.86(Preferred)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : 24 June 2013 20:34:35
Lease Expires . . . . . : 25 June 2013 20:34:35
Default Gateway . . . . . : 192.168.1.254
DHCP Server . . . . . : 192.168.1.254
DHCPv6 IAID . . . . . : 285220000
DHCPv6 Client DUID. . . . . : 00-01-00-01-16-C3-4A-46-00-00-00-00-00-00
DNS Servers . . . . . : 192.168.1.254
192.168.1.254
Primary WINS Server . . . . . : 192.168.1.254

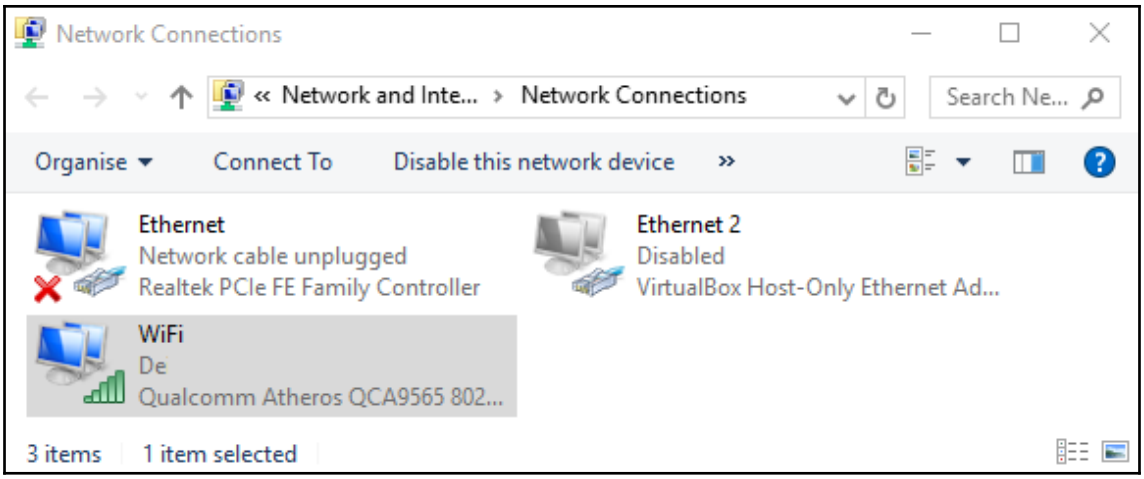

Standard Network Cable
Laptop / Computer
WiFi Link
to Internet
Raspberry Pi (Model B)
Imaged
SD Card
Micro USB 5V 1000mA

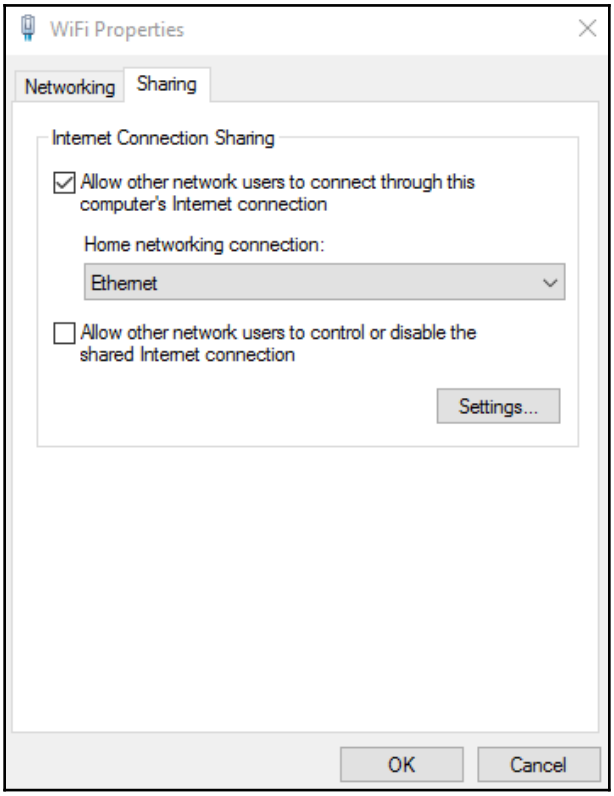

Network Connections
« Network and Inte... › Network Connections
Search Ne...
Organise
Ethernet
Network cable unplugged
Realtek PCIe FE Family Controller
Ethernet 2
Disabled
VirtualBox Host-Only Ethernet Ad...
WiFi
De
Qualcomm Atheros QCA9565 802...
3 items

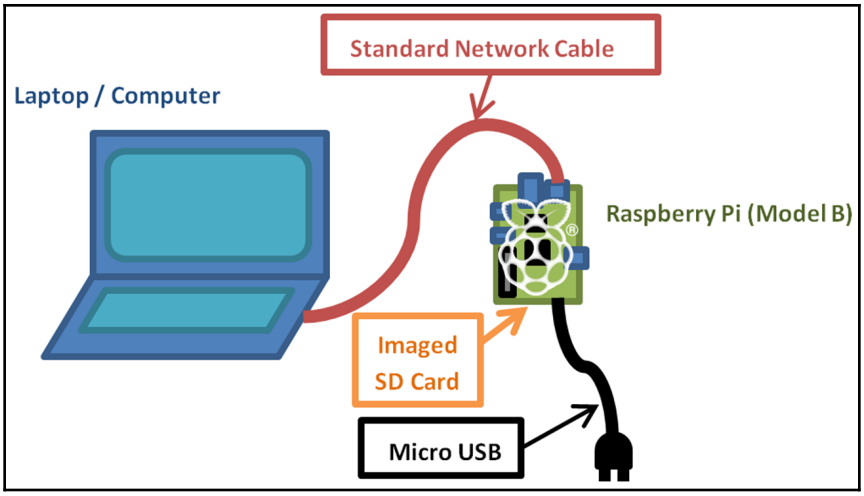

Ethernet Properties
Networking
Sharing
Connect using:
Realtek PCIe FE Family Controller
Configure...
This connection uses the following items:
Client for Microsoft Networks
File and Printer Sharing for Microsoft Networks
QoS Packet Scheduler
Internet Protocol Version 4 (TCP/IPv4)
Microsoft LLDP Protocol Driver
Link-Layer Topology Discovery Mapper I/O Driver
Microsoft Network Adapter Multiplexor Protocol
Install...
Uninstall
Properties
Description
Transmission Control Protocol/Internet Protocol. The default wide area network protocol that provides communication across diverse interconnected networks.
OK
Cancel
Internet Protocol Version 4 (TCP/IPv4) Properties
General
Alternative Configuration
You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.
Obtain an IP address automatically
Use the following IP address:
IP address:
Subnet mask:
Default gateway:
Obtain DNS server address automatically
Use the following DNS server addresses:
Preferred DNS server:
Alternative DNS server:
Validate settings upon exit
Advanced...
OK
Cancel

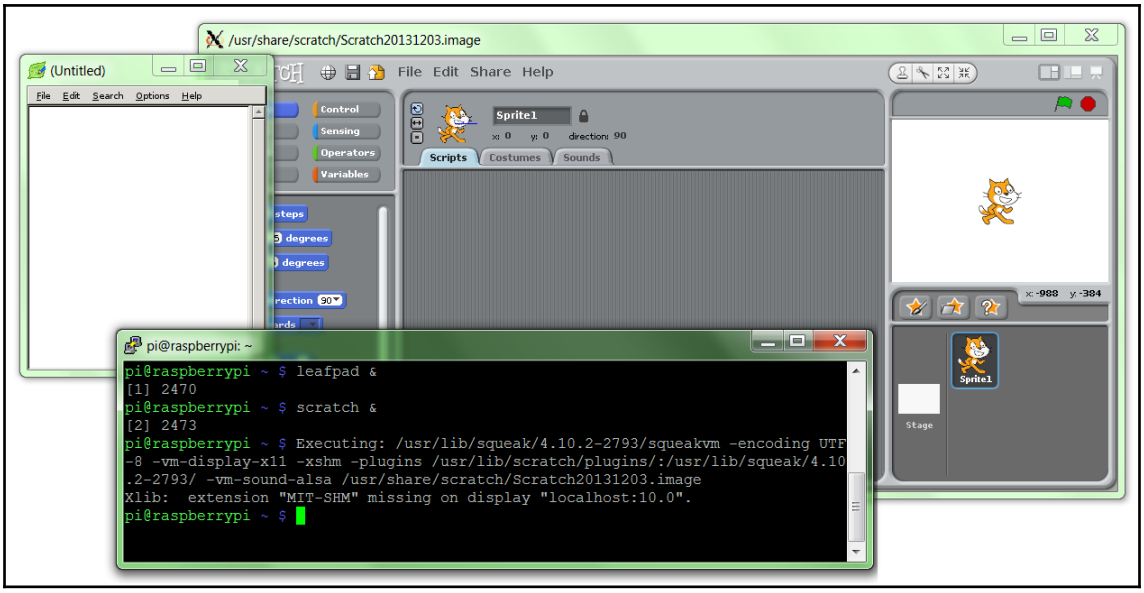

Editing Wired connection 1
Connection name:
Wired connection 1
Connect automatically
Wired
802.1x Security
IPv4 Settings
IPv6 Settings
Method:
Shared to other computers
Addresses
Address
Netmask
Gateway
Add
Delete
DNS servers:
Search domains:
DHCP client ID:
Require IPv4 addressing for this connection to complete
Routes...
Available to all users
Cancel
Save...

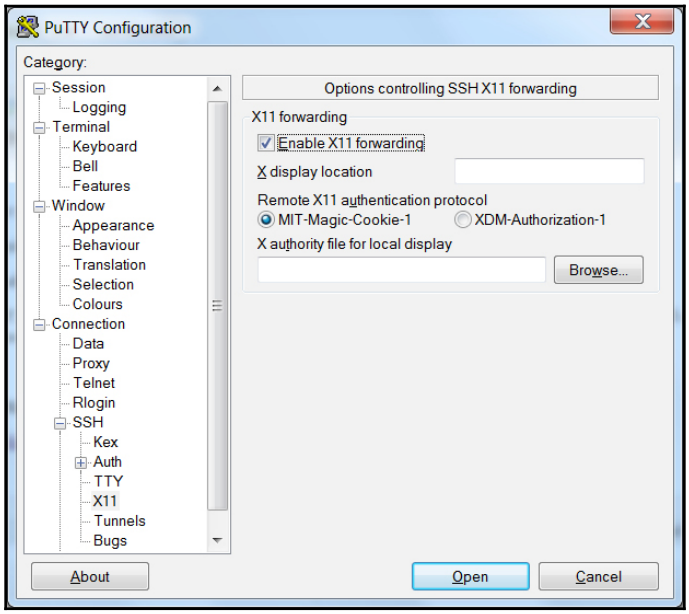

Network
Show All
Location: Automatic
Ethernet
Self-Assigned IP
AirPort
Connected
Bluetooth PAN
Not Connected
FireWire
Inactive
Status: Connected
Ethernet has a self-assigned IP address and will not be able to connect to the Internet.
Configure IPv4: Using DHCP
IP Address: 169.254.35.19
Subnet Mask: 255.255.0.0
Router:
DNS Server:
Search Domains:
Advanced...
Click the lock to prevent further changes.
Assist me...
Revert
Apply

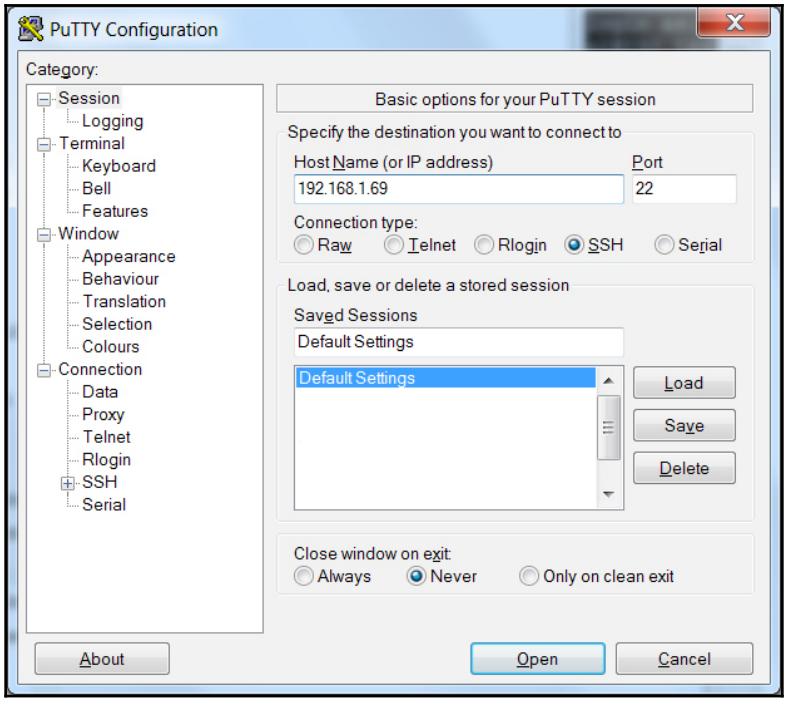

Network Connections
« Network and Inte... › Network Connections
Search Ne...
Organise
Connect To
Disable this network device
Ethernet
Network cable unplugged
Realtek PCIe FE Family Controller
Ethernet 2
Disabled
VirtualBox Host-Only Ethernet Ad...
WiFi
De
Qualcomm Atheros QCA9565 802...
3 items
1 item selected

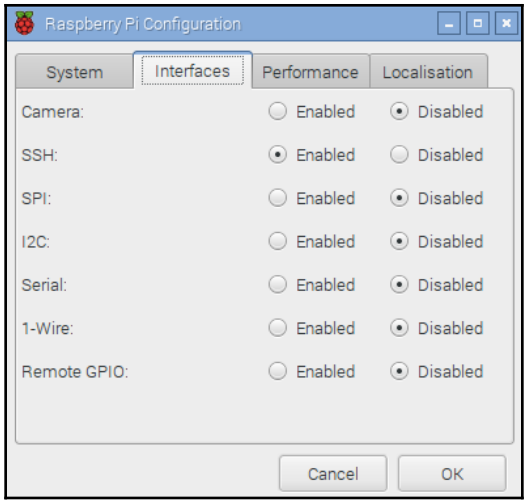

WiFi Properties
Networking
Sharing
Internet Connection Sharing
Allow other network users to connect through this computer's Internet connection
Home networking connection:
Ethernet
Allow other network users to control or disable the shared Internet connection
Settings...
OK
Cancel


Standard Network Cable
Laptop / Computer
Raspberry Pi (Model B)
Imaged
SD Card
Micro USB


/usr/share/scratch/Scratch20131203.image
(Untitled)
File Edit Search Options Help
File Edit Share Help
Control
Sensing
Operators
Variables
Sprite1
Scripts
Costumes
Sounds
Stage
pi@raspberrypi: ~
pi@raspberrypi ~ $ leafpad &
[1] 2470
pi@raspberrypi ~ $ scratch &
[2] 2473
pi@raspberrypi ~ $ Executing: /usr/lib/squeak/4.10.2-2793/squeakvm -encoding UTF
-8 -vm-display-x11 -xshm -plugins /usr/lib/scratch/plugins/:/usr/lib/squeak/4.10
.2-2793/ -vm-sound-alsa /usr/share/scratch/Scratch20131203.image
Xlib: extension "MIT-SHM" missing on display "localhost:10.0".
pi@raspberrypi ~ $


PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Kex
Auth
TTY
X11
Tunnels
Bugs
Options controlling SSH X11 forwarding
X11 forwarding
Enable X11 forwarding
X display location
Remote X11 authentication protocol
MIT-Magic-Cookie-1
XDM-Authorization-1
X authority file for local display
Browse...
About
Open
Cancel


PuTTY Configuration
Category:
Session
Logging
Terminal
Keyboard
Bell
Features
Window
Appearance
Behaviour
Translation
Selection
Colours
Connection
Data
Proxy
Telnet
Rlogin
SSH
Serial
Basic options for your PuTTY session
Specify the destination you want to connect to
Host Name (or IP address)
Port
192.168.1.69
22
Connection type:
Raw
Telnet
Rlogin
SSH
Serial
Load, save or delete a stored session
Saved Sessions
Default Settings
Default Settings
Load
Save
Delete
Close window on exit:
Always
Never
Only on clean exit
About
Open
Cancel


Raspberry Pi Configuration
System
Interfaces
Performance
Localisation
Camera:
Enabled
Disabled
SSH:
Enabled
Disabled
SPI:
Enabled
Disabled
I2C:
Enabled
Disabled
Serial:
Enabled
Disabled
1-Wire:
Enabled
Disabled
Remote GPIO:
Enabled
Disabled
Cancel
OK

The **Pi-Kitchen** allows easy customisation of standard distributions.

Chapter 2: Dividing Text Data and Building Text Classifiers

```
manju@manju-HP-Notebook:~/Documents$ python Building_text_classifier.py

Dimensions of training data: (2968, 40605)

Input: The curveballs of right handed pitchers tend to curve to the left
Predicted category: Baseball

Input: Caesar cipher is an ancient form of encryption
Predicted category: Cryptography

Input: This two-wheeler is really good on slippery roads
Predicted category: Motorbikes
manju@manju-HP-Notebook:~/Documents$
```

```
manju@manju-HP-Notebook:~/Documents$ python tokenization.py

Sentence tokenizer:
['Tokenization is the process of dividing text into a set of meaningful pieces.'
, 'These pieces are called tokens.']

Word tokenizer:
['Tokenization', 'is', 'the', 'process', 'of', 'dividing', 'text', 'into', 'a',
'set', 'of', 'meaningful', 'pieces', '.', 'These', 'pieces', 'are', 'called', 't
okens', '.']

Word punct tokenizer:
['Tokenization', 'is', 'the', 'process', 'of', 'dividing', 'text', 'into', 'a',
'set', 'of', 'meaningful', 'pieces', '.', 'These', 'pieces', 'are', 'called', 't
okens', '.']
manju@manju-HP-Notebook:~/Documents$
```

```
manju@manju-HP-Notebook:~$ cd Documents
manju@manju-HP-Notebook:~/Documents$ python stemming.py

            WORD          PORTER       LANCASTER        SNOWBALL

         ability            abil             abl            abil
            baby            babi            baby            babi
         college         colleg          colleg          colleg
         playing            play            play            play
              is              is              is              is
           dream           dream           dream           dream
        election           elect           elect           elect
         beaches           beach           beach           beach
           image            imag              im            imag
           group           group           group           group
           happy           happi           happy           happi
manju@manju-HP-Notebook:~/Documents$
```

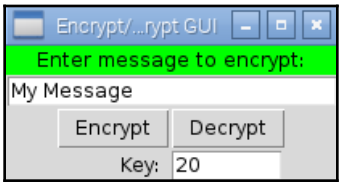
```
manju@manju-HP-Notebook:~/Documents$ python chunking.py
Number of text chunks = 7
manju@manju-HP-Notebook:~/Documents$
```

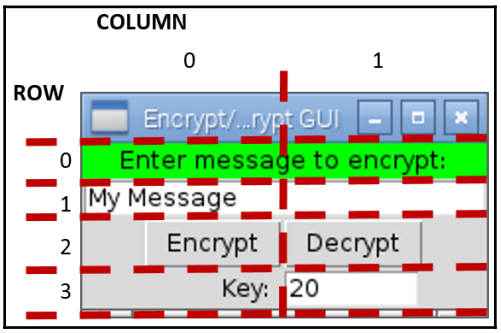
```
manju@manju-HP-Notebook:~$ cd Documents
manju@manju-HP-Notebook:~/Documents$ python bag_of_word.py

Vocabulary:
[u'about' u'after' u'against' u'aid' u'all' u'also' u'an' u'and' u'are'
 u'as' u'at' u'be' u'been' u'before' u'but' u'by' u'committee' u'congress'
 u'did' u'each' u'education' u'first' u'for' u'from' u'general' u'had'
 u'has' u'have' u'he' u'health' u'his' u'house' u'in' u'increase' u'is'
 u'it' u'last' u'made' u'make' u'may' u'more' u'no' u'not' u'of' u'on'
 u'one' u'only' u'or' u'other' u'out' u'over' u'pay' u'program'
 u'proposed' u'said' u'similar' u'state' u'such' u'take' u'than' u'that'
 u'the' u'them' u'there' u'they' u'this' u'time' u'to' u'two' u'under'
 u'up' u'was' u'were' u'what' u'which' u'who' u'will' u'with' u'would'
 u'year' u'years']
```

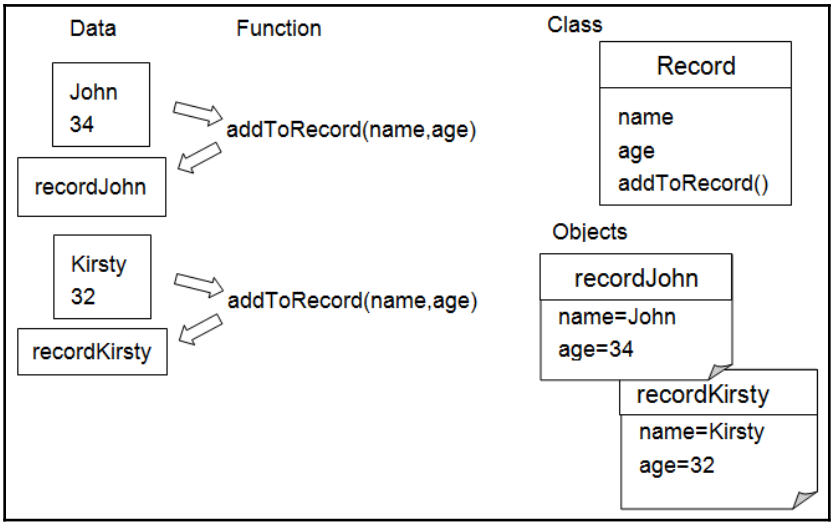
Document term matrix:

Word	Chunk-0	Chunk-1	Chunk-2	Chunk-3	Chunk-4
about	1	1	1	1	3
after	2	3	2	1	3
against	1	2	2	1	1
aid	1	1	1	3	5
all	2	2	5	2	1
also	3	3	3	4	3
an	5	7	5	7	10
and	34	27	36	36	41
are	5	3	6	3	2
as	13	4	14	18	4
at	5	7	9	3	6
be	20	14	7	10	18
been	7	1	6	15	5
before	2	2	1	1	2
but	3	3	2	9	5
by	8	22	15	14	12
committee	2	10	3	1	7
congress	1	1	3	3	1
did	2	1	1	2	2
each	1	1	4	3	1
education	3	2	3	1	1
first	4	1	4	6	3
for	22	19	24	27	20
from	4	5	6	5	5
general	2	2	2	3	6
had	3	2	7	2	6
has	10	2	5	20	11
have	4	4	4	7	5
he	4	13	12	13	29
health	1	1	2	6	1
his	10	6	9	3	7
house	5	7	4	4	2
in	38	27	37	49	45
increase	3	1	1	4	1
is	12	9	12	14	8
it	18	16	5	6	9
last	1	1	5	4	2
made	1	1	7	4	3
make	3	2	1	1	1
may	1	1	2	2	1
more	3	5	4	6	7
no	4	1	1	7	3
not	5	6	3	14	7
of	61	69	76	56	53
on	10	18	14	13	13
one	4	5	3	4	9
only	1	1	1	3	2
or	4	4	5	5	4
other	2	6	7	1	3
out	3	3	3	4	1
over	1	1	5	1	2

Chapter 3: Using Python for Automation and Productivity






Data
Function
Class
John
34
addToRecord(name,age)
recordJohn
Record
name
age
addToRecord()
Kirsty
32
addToRecord(name,age)
recordKirsty
Objects
recordJohn
name=John
age=34
recordKirsty
name=Kirsty
age=32

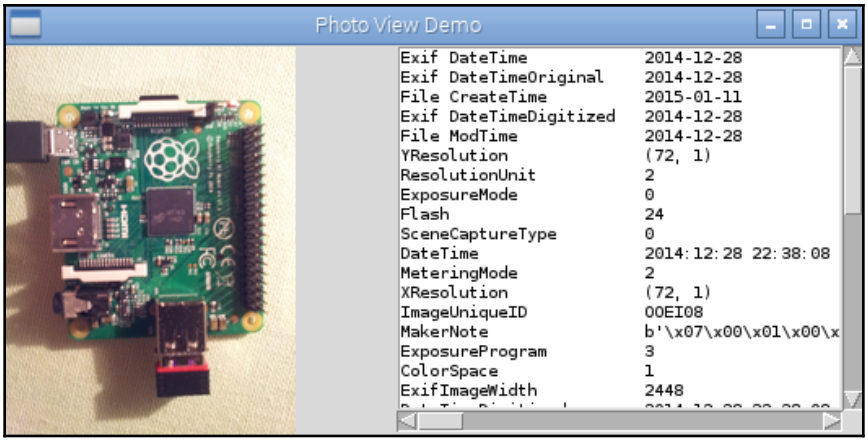
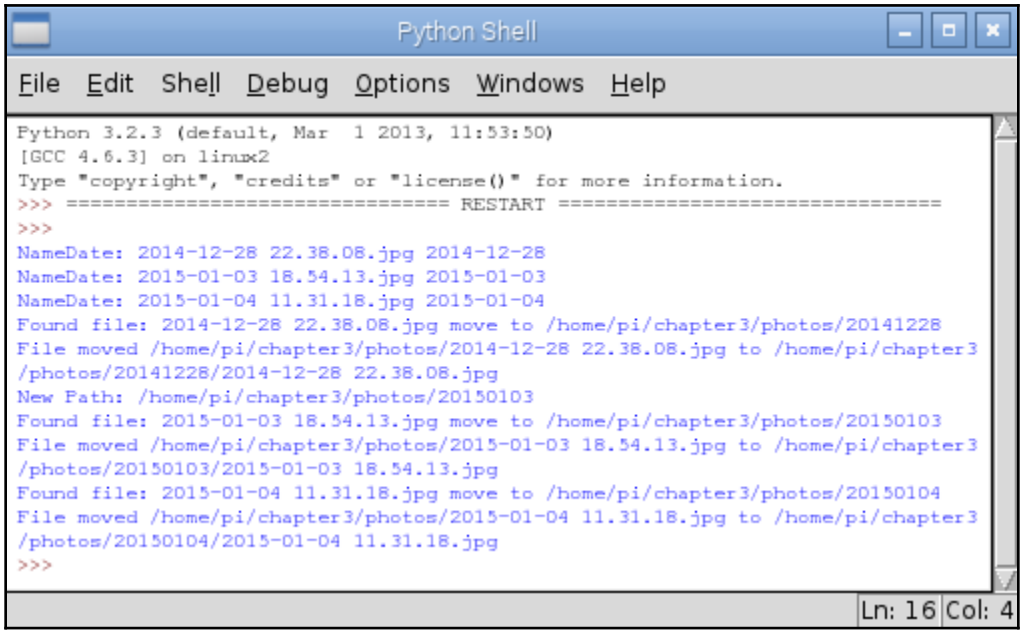
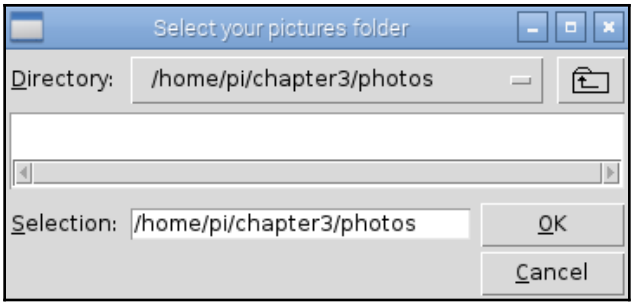


Photo View Demo
Exif DateTime 2014-12-28
Exif DateTimeOriginal 2014-12-28
File CreateTime 2015-01-11
Exif DateTimeDigitized 2014-12-28
File ModTime 2014-12-28
YResolution (72, 1)
ResolutionUnit 2
ExposureMode 0
Flash 24
SceneCaptureType 0
DateTime 2014:12:28 22:38:08
MeteringMode 2
XResolution (72, 1)
ImageUniqueID 00EI08
MakerNote b'\x07\x00\x01\x00\x
ExposureProgram 3
ColorSpace 1
ExifImageWidth 2448


Python Shell
File Edit Shell Debug Options Windows Help
Python 3.2.3 (default, Mar 1 2013, 11:53:50)
[GCC 4.6.3] on linux2
Type "copyright", "credits" or "license()" for more information.
>>> ========== RESTART ==========
>>>
NameDate: 2014-12-28 22.38.08.jpg 2014-12-28
NameDate: 2015-01-03 18.54.13.jpg 2015-01-03
NameDate: 2015-01-04 11.31.18.jpg 2015-01-04
Found file: 2014-12-28 22.38.08.jpg move to /home/pi/chapter3/photos/20141228
File moved /home/pi/chapter3/photos/2014-12-28 22.38.08.jpg to /home/pi/chapter3/photos/20141228/2014-12-28 22.38.08.jpg
New Path: /home/pi/chapter3/photos/20150103
Found file: 2015-01-03 18.54.13.jpg move to /home/pi/chapter3/photos/20150103
File moved /home/pi/chapter3/photos/2015-01-03 18.54.13.jpg to /home/pi/chapter3/photos/20150103/2015-01-03 18.54.13.jpg
Found file: 2015-01-04 11.31.18.jpg move to /home/pi/chapter3/photos/20150104
File moved /home/pi/chapter3/photos/2015-01-04 11.31.18.jpg to /home/pi/chapter3/photos/20150104/2015-01-04 11.31.18.jpg
>>>
Ln: 16 Col: 4


Select your pictures folder
Directory:
/home/pi/chapter3/photos
Selection:
/home/pi/chapter3/photos
OK
Cancel

Chapter 4: Predicting Sentiments in Words

```
manju@manju-HP-Notebook:~/Documents$ python Building_Naive_Bayes_classifier.py
correctness of the classification = 93.67 %
manju@manju-HP-Notebook:~/Documents$
```

```
manju@manju-HP-Notebook:~/Documents$ python logistic_regression.py
```

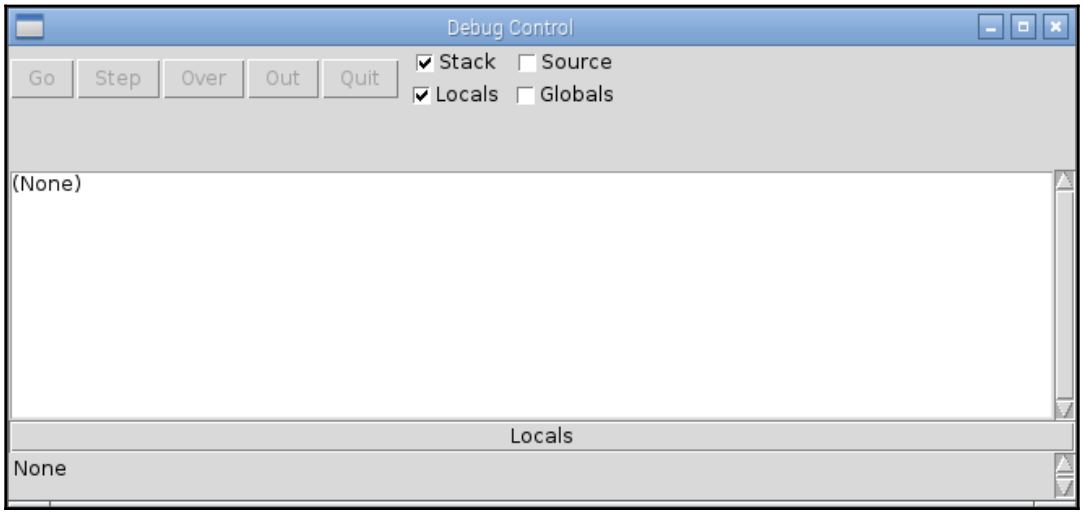
```
manju@manju-HP-Notebook:~/Documents$ python Splitting_dataset.py
/usr/local/lib/python2.7/dist-packages/sklearn/cross_validation.py:41: Deprecati
onWarning: This module was deprecated in version 0.18 in favor of the model_sele
ction module into which all the refactored classes and functions are moved. Also
 note that the interface of the new CV iterators are different from that of this
 module. This module will be removed in 0.20.
  "This module will be removed in 0.20.", DeprecationWarning)
correctness of the classification = 92.0 %
manju@manju-HP-Notebook:~/Documents$
```

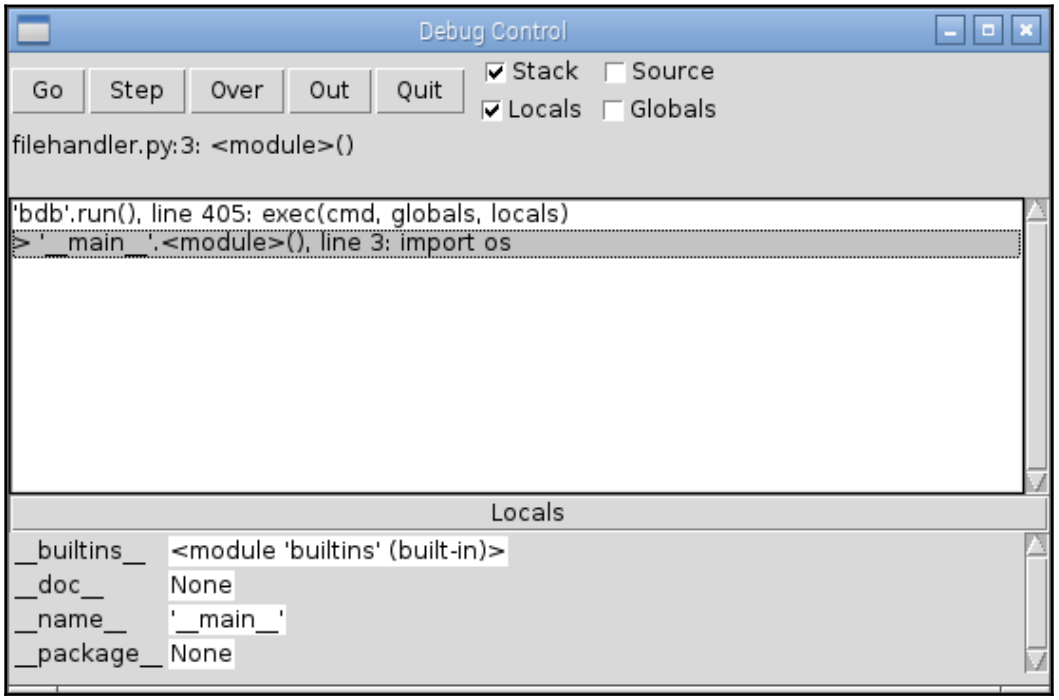
```
manju@manju-HP-Notebook:~/Documents$ python cross_validation.py
/usr/local/lib/python2.7/dist-packages/sklearn/cross_validation.py:41: DeprecationWarning: This module was deprecated in version 0.18 in favor
of the model_selection module into which all the refactored classes and functions are moved. Also note that the interface of the new CV iterato
rs are different from that of this module. This module will be removed in 0.20.
  "This module will be removed in 0.20.", DeprecationWarning)
Accuracy: 75.13%
f1: 74.73%
Precision: 74.61%
Recall: 75.13%
manju@manju-HP-Notebook:~/Documents$
```

```
manju@manju-HP-Notebook:~/Documents$ python sentiment_analysis.py

Number of training datapoints: 1600
Number of test datapoints: 400

Accuracy of the classifiers: 0.735

Top 10 most informative words:
outstanding
insulting
vulnerable
ludicrous
uninvolving
astounding
avoids
fascination
animators
darker

Predictions:

Review: The Movie was amazing

Review: the movie was dull. I would never recommend it to anyone.

Review: The cinematography is pretty great in the movie

Review: The direction was horrible and the story was all over the place
Predicted sentiment: Negative
Probability: 0.51
manju@manju-HP-Notebook:~/Documents$
```

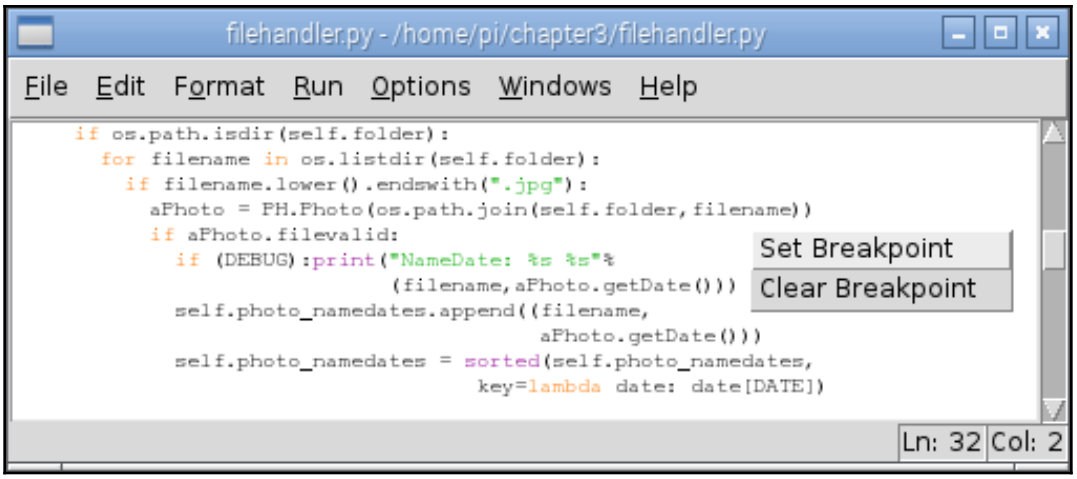
```
manju@manju-HP-Notebook:~/Documents$ python topic_modeling.py
Most contributing words to the topics:

Topic 0 ==> 0.067*"drive" + 0.066*"pressur" + 0.039*"caus" + 0.039*"doctor"

Topic 1 ==> 0.090*"sugar" + 0.064*"father" + 0.064*"sister" + 0.038*"practic"
manju@manju-HP-Notebook:~/Documents$
```

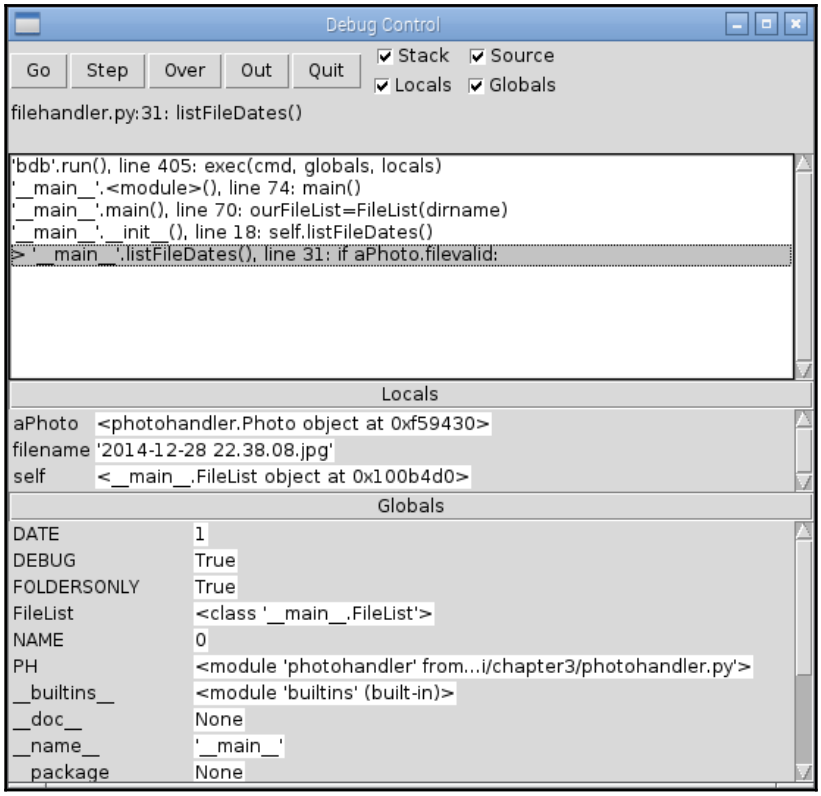
Chapter 5: Creating Games and Graphics

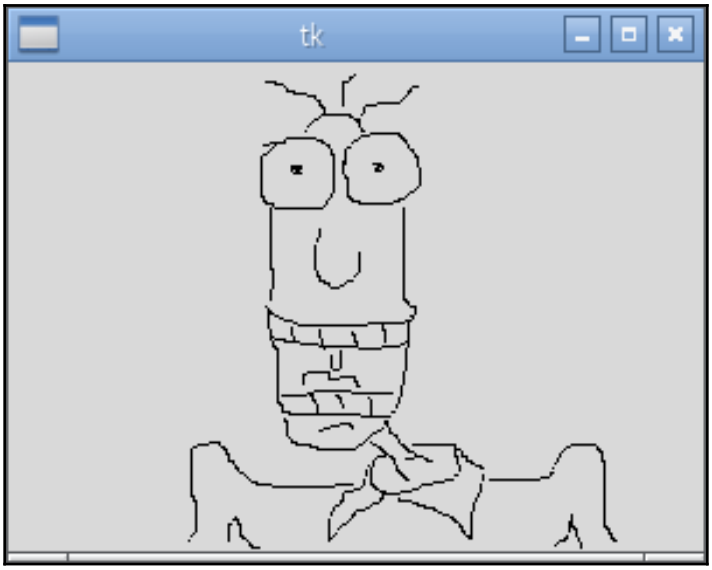


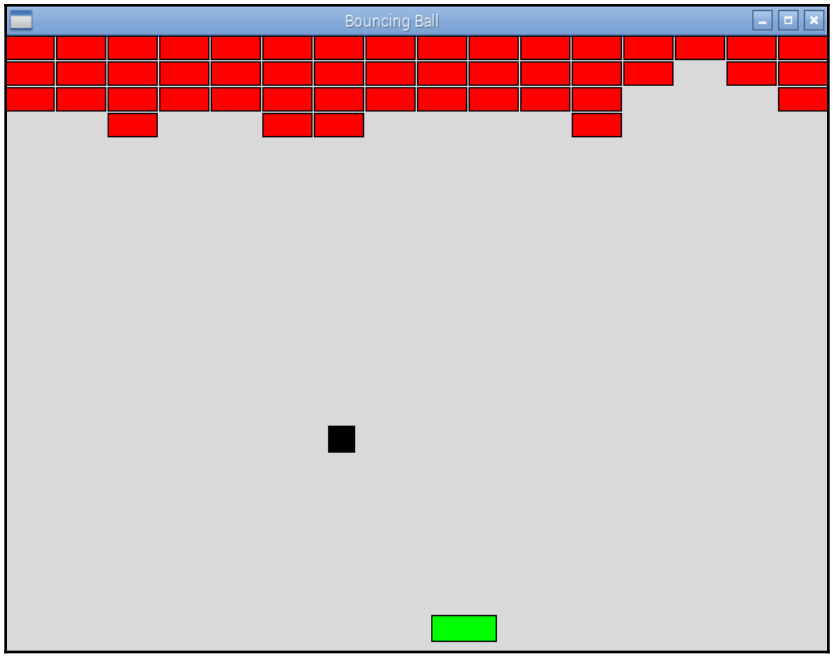


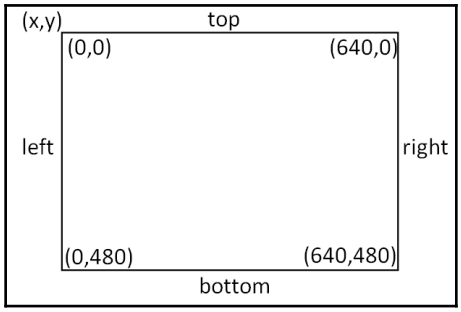

Go
Step
Over
Out
Quit
Stack
Source
Locals
Globals

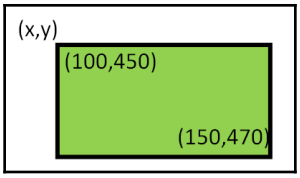

filehandler.py - /home/pi/chapter3/filehandler.py
File Edit Format Run Options Windows Help
if os.path.isdir(self.folder):
for filename in os.listdir(self.folder):
if filename.lower().endswith(".jpg"):
aPhoto = PH.Photo(os.path.join(self.folder,filename))
if aPhoto.filevalid:
if (DEBUG):print("NameDate: %s %s"%
(filename,aPhoto.getDate()))
self.photo_namedates.append((filename,
aPhoto.getDate()))
self.photo_namedates = sorted(self.photo_namedates,
key=lambda date: date[DATE])
Set Breakpoint
Clear Breakpoint
Ln: 32
Col: 2

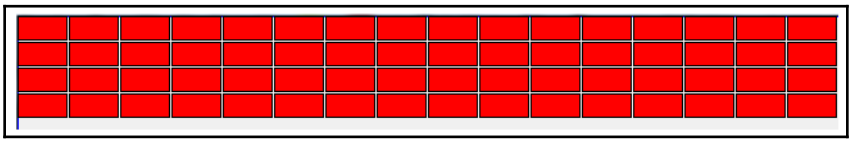

Debug Control
Go
Step
Over
Out
Quit
Stack
Source
Locals
Globals
filehandler.py:31: listFileDates()
'bdb'.run(), line 405: exec(cmd, globals, locals)
'__main__'.<module>(), line 74: main()
'__main__'.main(), line 70: ourFileList=FileList(dirname)
'__main__'.__init__(), line 18: self.listFileDates()
> '__main__'.listFileDates(), line 31: if aPhoto.filevalid:
Locals
aPhoto <photohandler.Photo object at 0xf59430>
filename '2014-12-28 22.38.08.jpg'
self <__main__.FileList object at 0x100b4d0>
Globals
DATE 1
DEBUG True
FOLDERSONLY True
FileList <class '__main__.FileList'>
NAME 0
PH <module 'photohandler' from...i/chapter3/photohandler.py'>
__builtins__ <module 'builtins' (built-in)>
__doc__ None
__name__ '__main__'
__package None

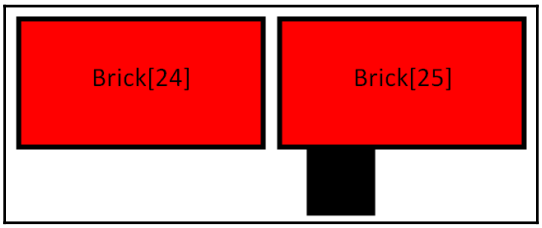

tk


Bouncing Ball

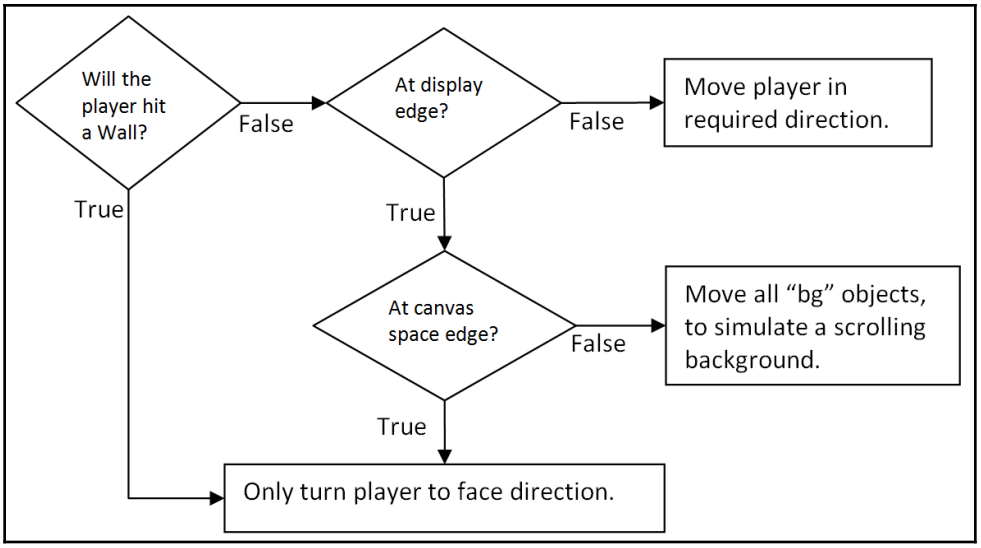

(x,y)
top
(0,0)
(640,0)
left
right
(0,480)
(640,480)
bottom

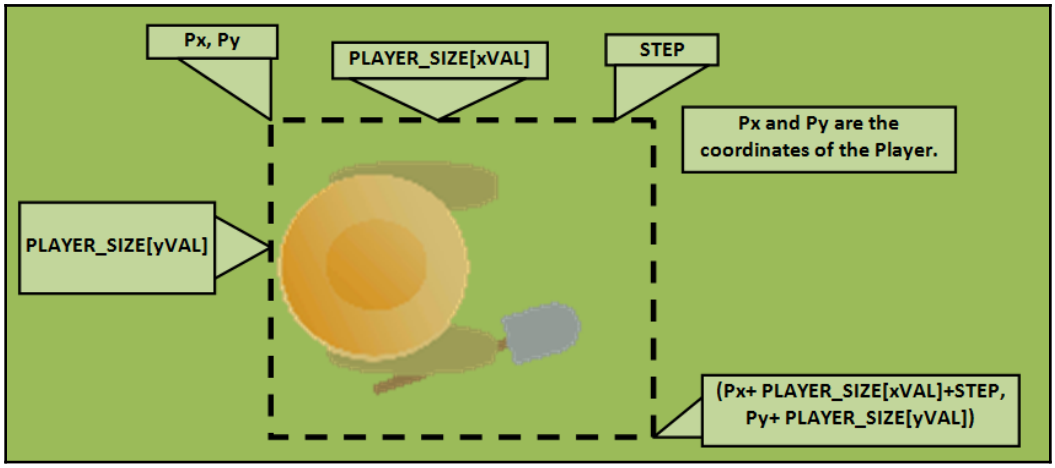

(x,y)
(100,450)
(150,470)

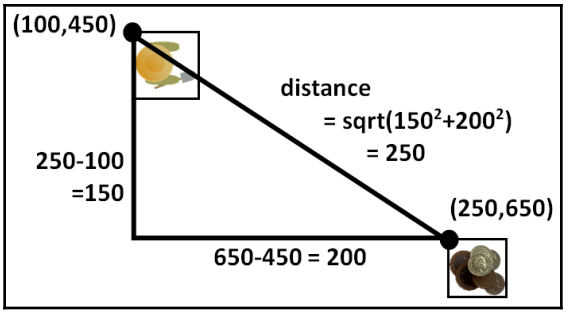



Brick[24]
Brick[25]


Overhead Game
You have found the gold in 6 tries!

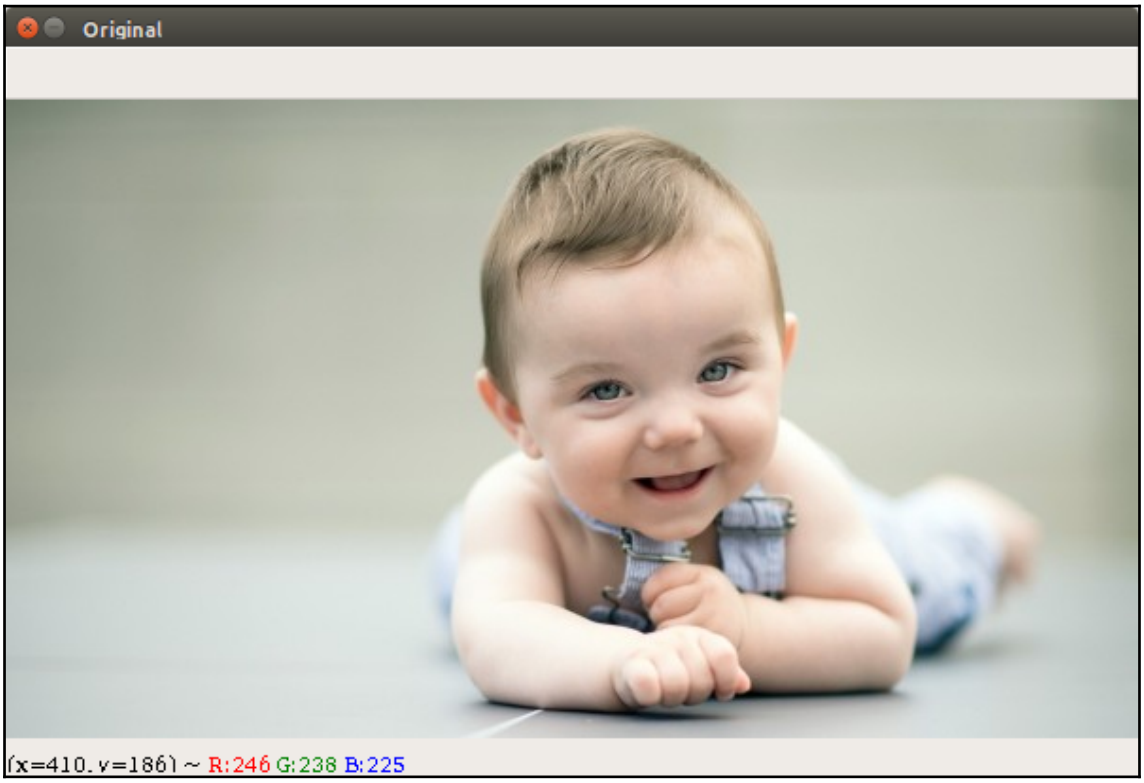

Will the player hit a Wall?
False
At display edge?
False
Move player in required direction.
True
True
At canvas space edge?
False
Move all “bg” objects, to simulate a scrolling background.
True
Only turn player to face direction.


Px, Py
PLAYER_SIZE[xVAL]
STEP
Px and Py are the coordinates of the Player.
PLAYER_SIZE[yVAL]
(Px+ PLAYER_SIZE[xVAL]+STEP, Py+ PLAYER_SIZE[yVAL])

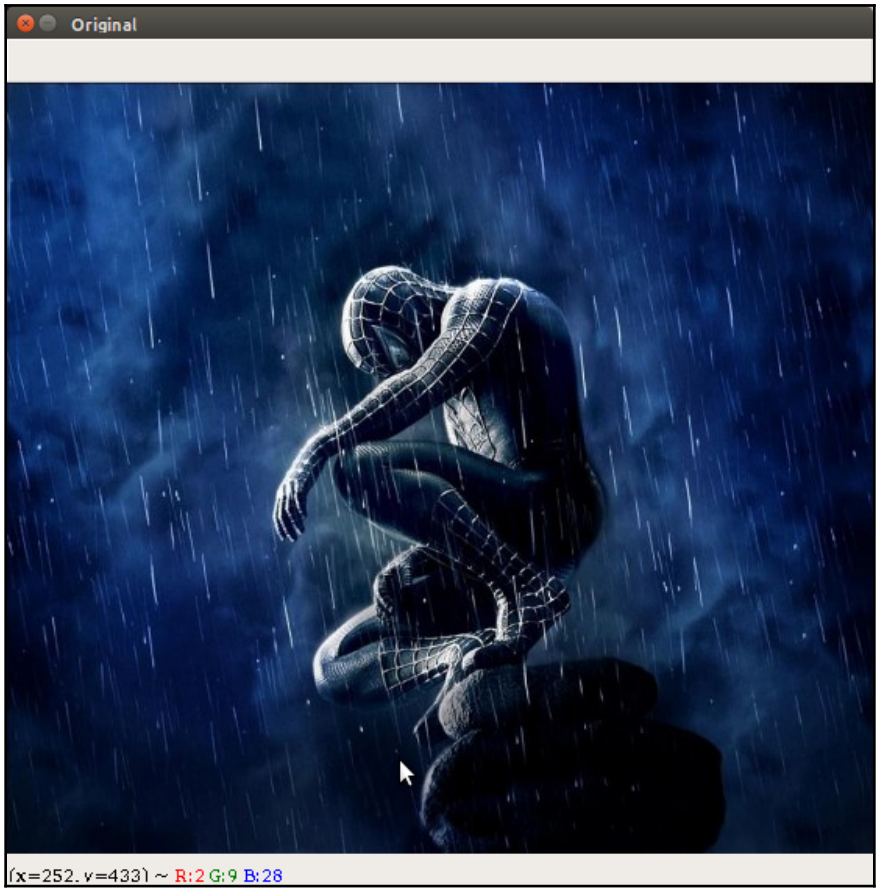

(100,450)
distance
= sqrt(150²+200²)
= 250
250-100
=150
(250,650)
650-450 = 200

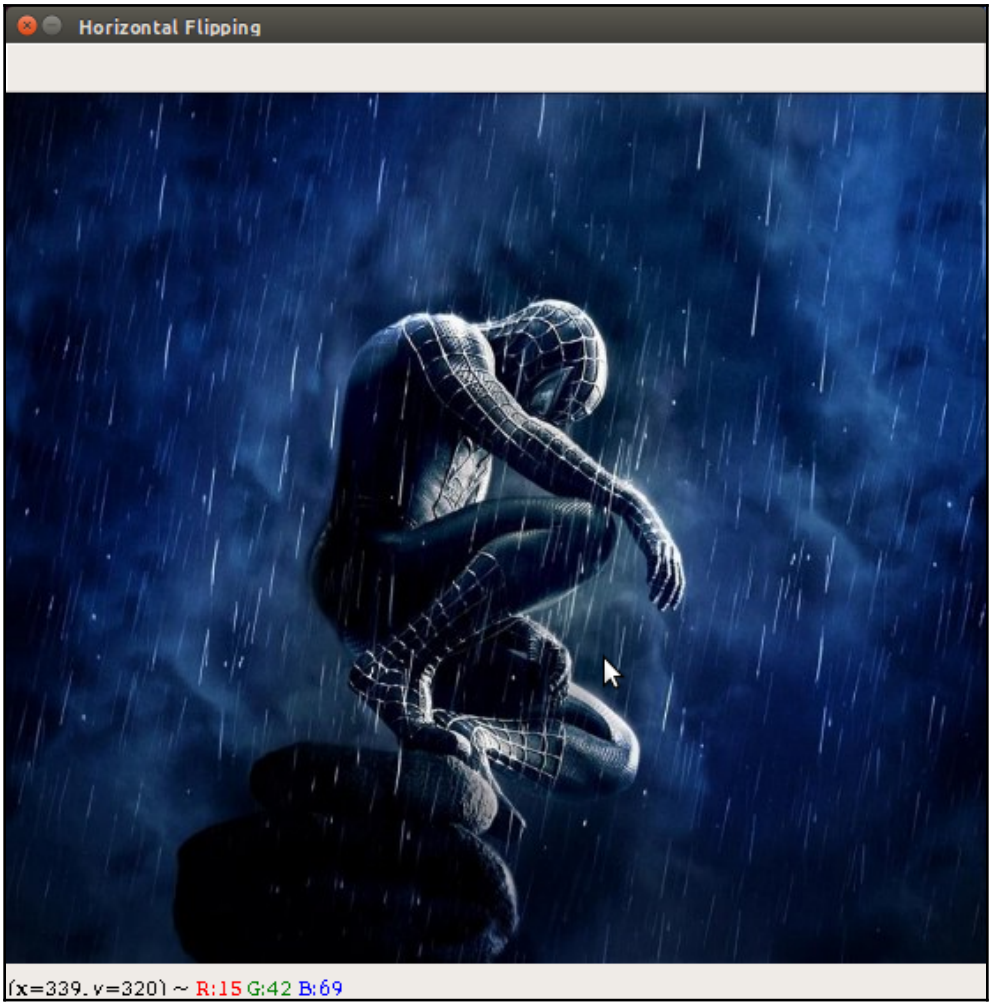
Chapter 6: Detecting Edges and Contours in Images

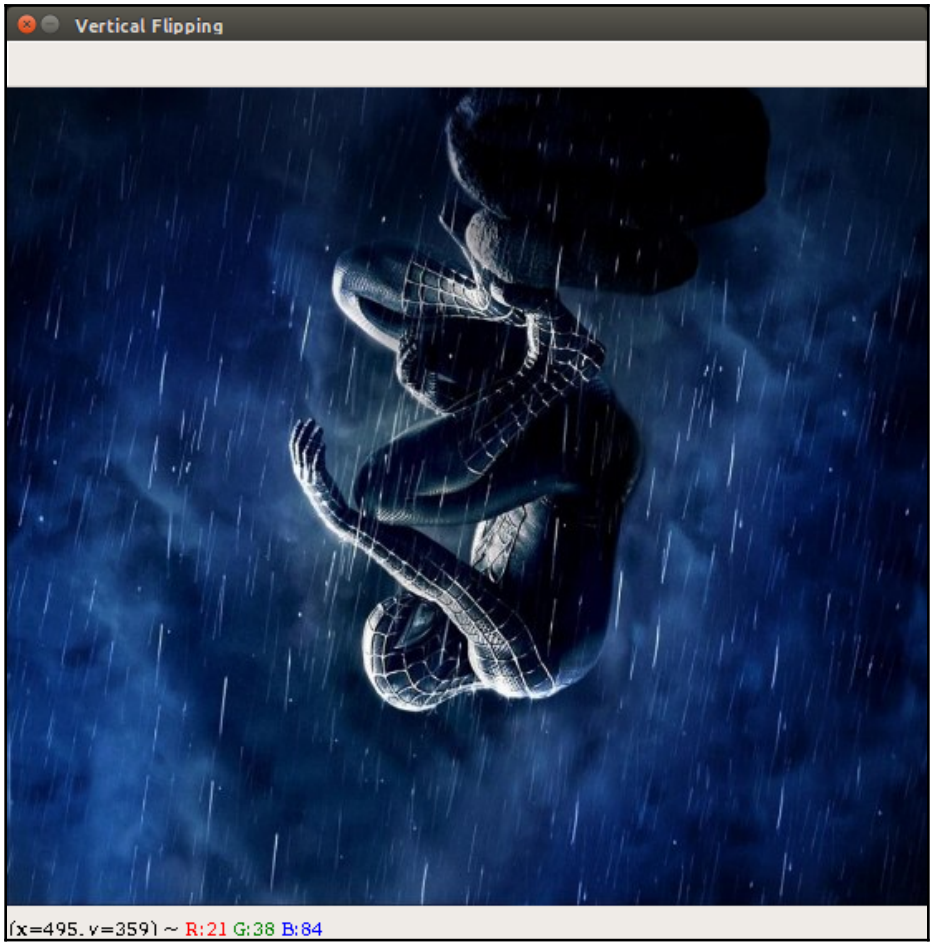
```
manju@manju-HP-Notebook:~/Documents$ python Load_Display_Save.py
```

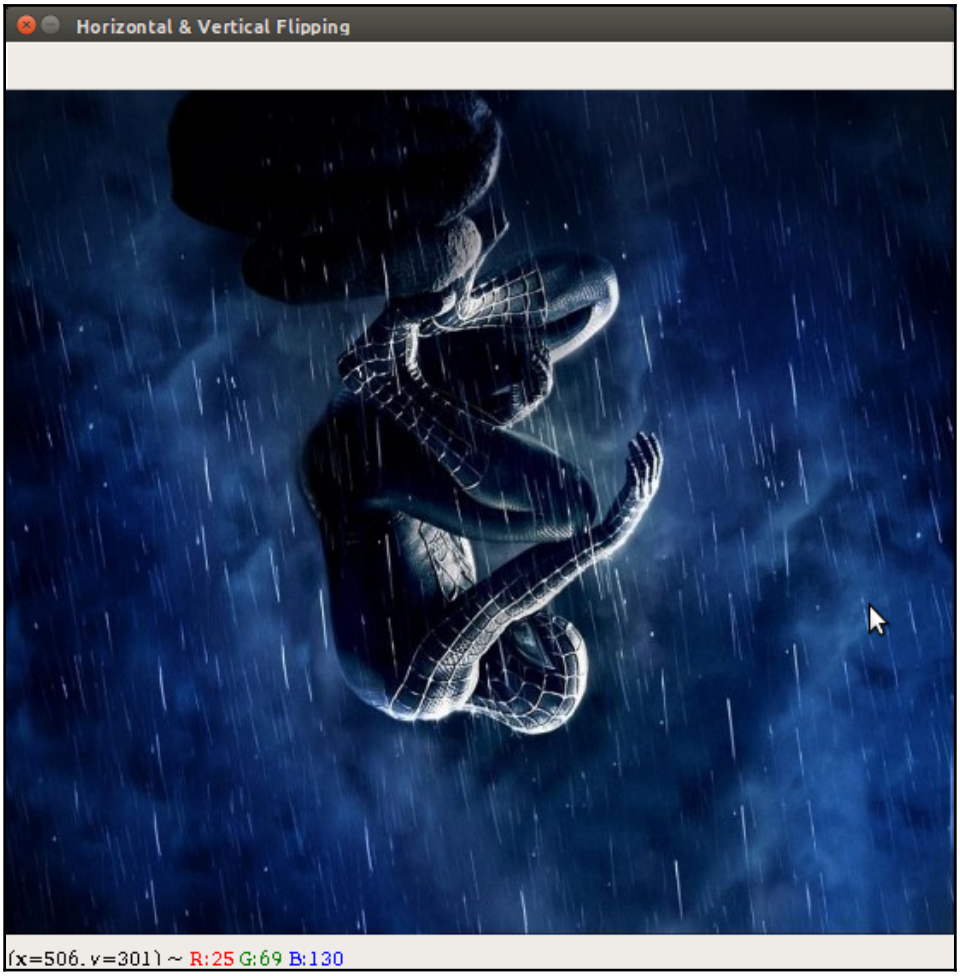



```
manju@manju-HP-Notebook:~/Documents$ python Flipping.py
```

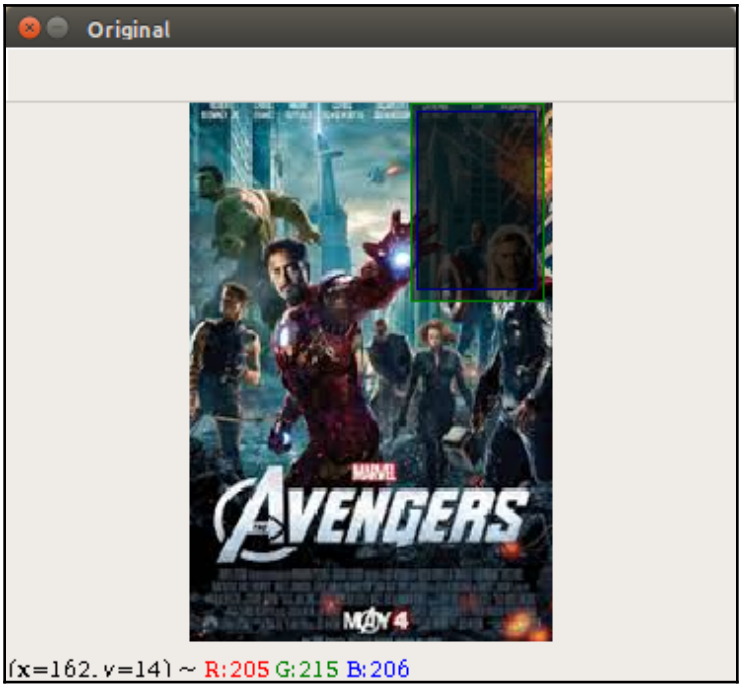

Original
(x=252, y=433) ~ R:2 G:9 B:28

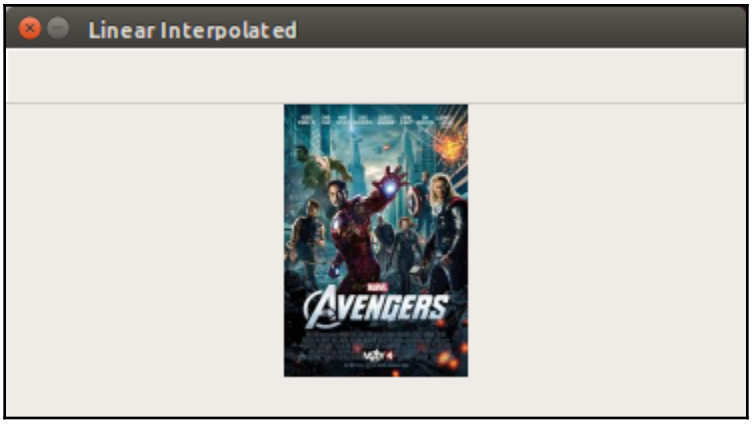

Horizontal Flipping
(x=339, y=320) ~ R:15 G:42 B:69


Vertical Flipping
(x=495, y=359) ~ R:21 G:38 B:84

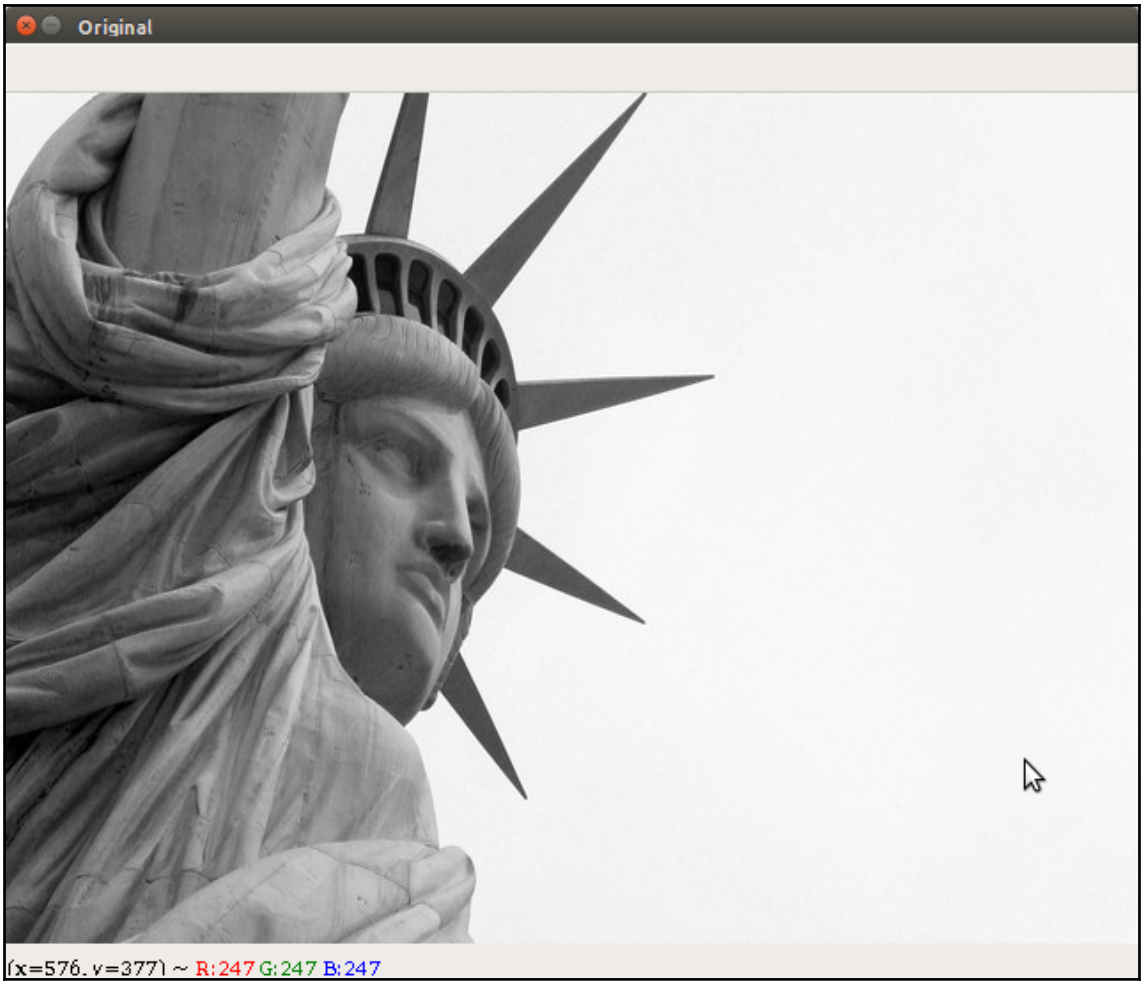


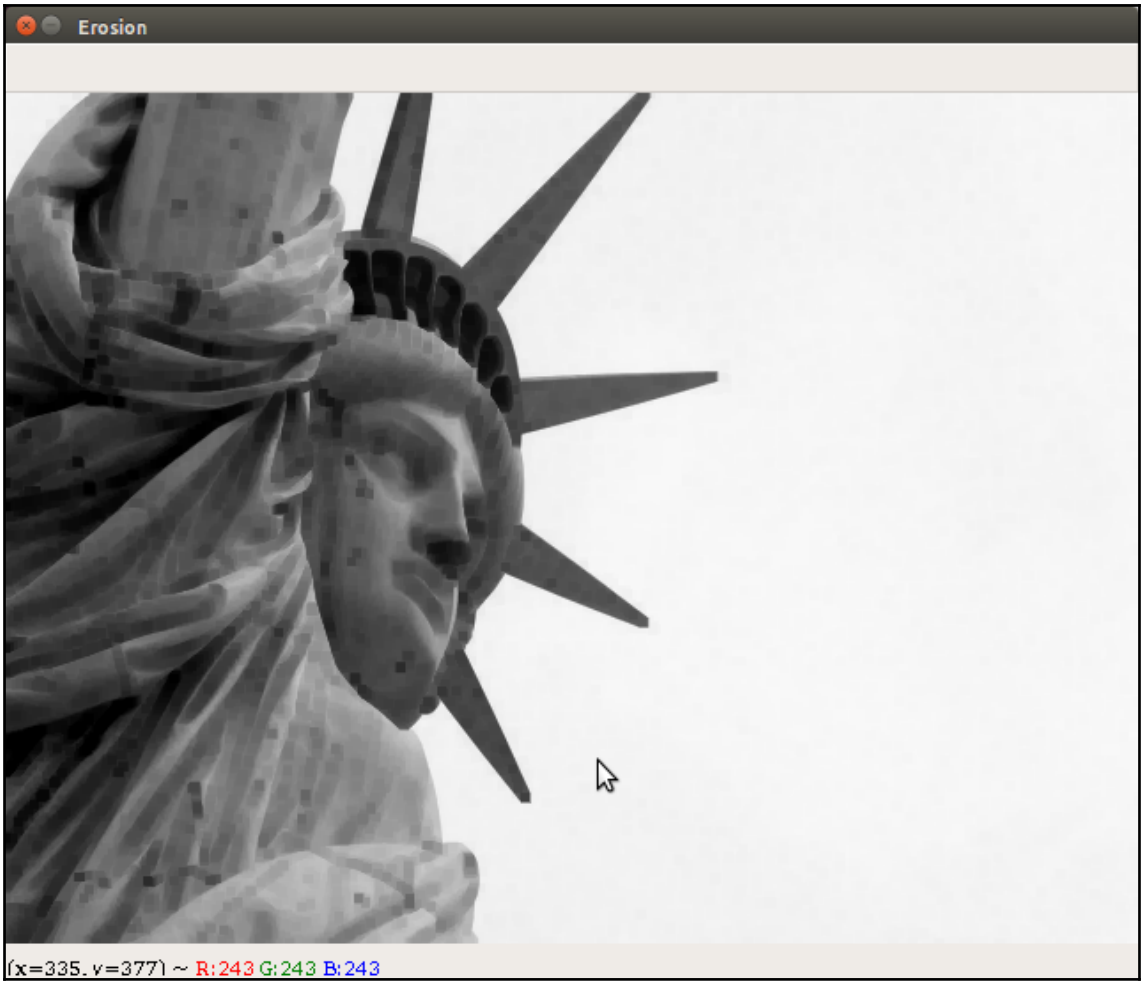

```
manju@manju-HP-Notebook:~/Documents$ python Scaling.py
```

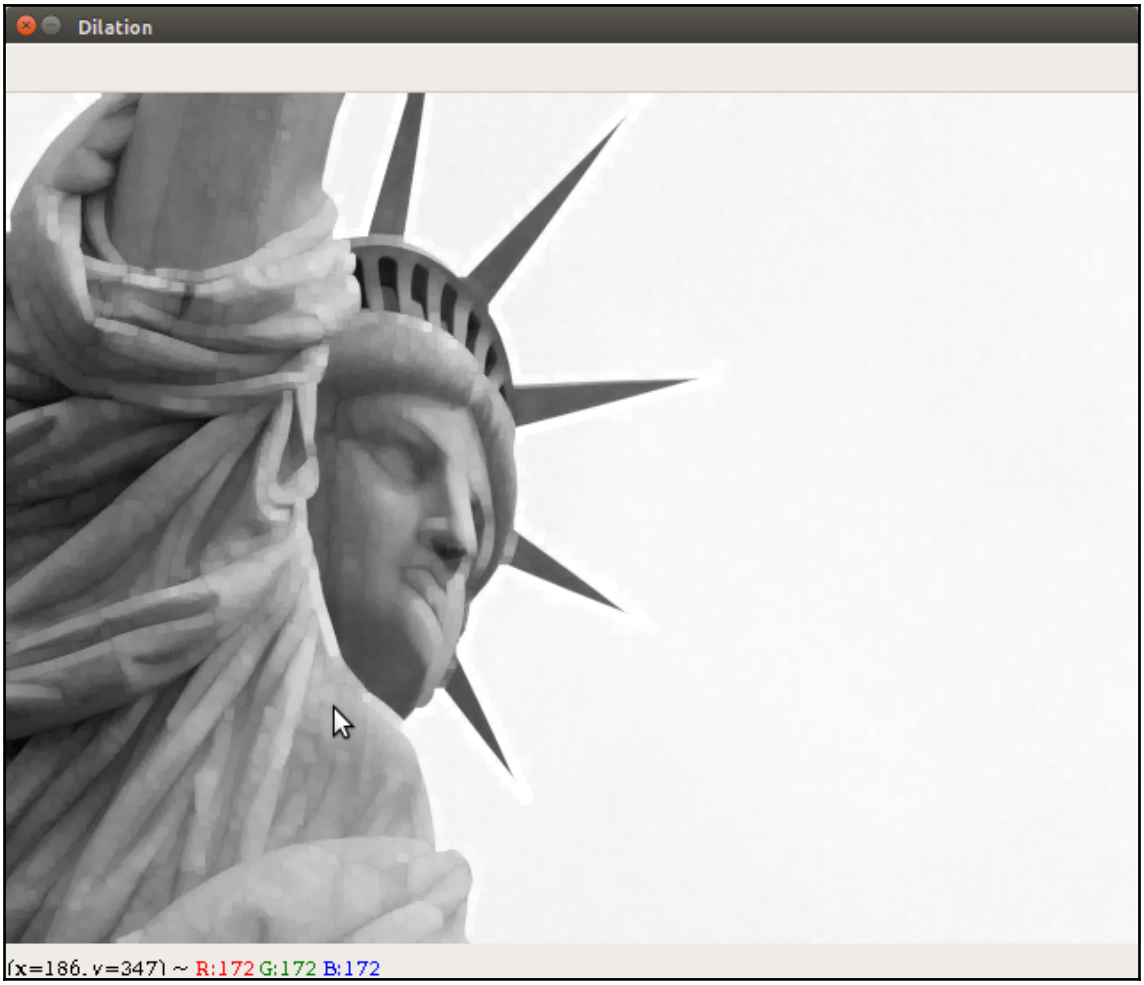

Original
MARVEL
AVENGERS
MAY 4
(x=162, y=14) ~ R:205 G:215 B:206

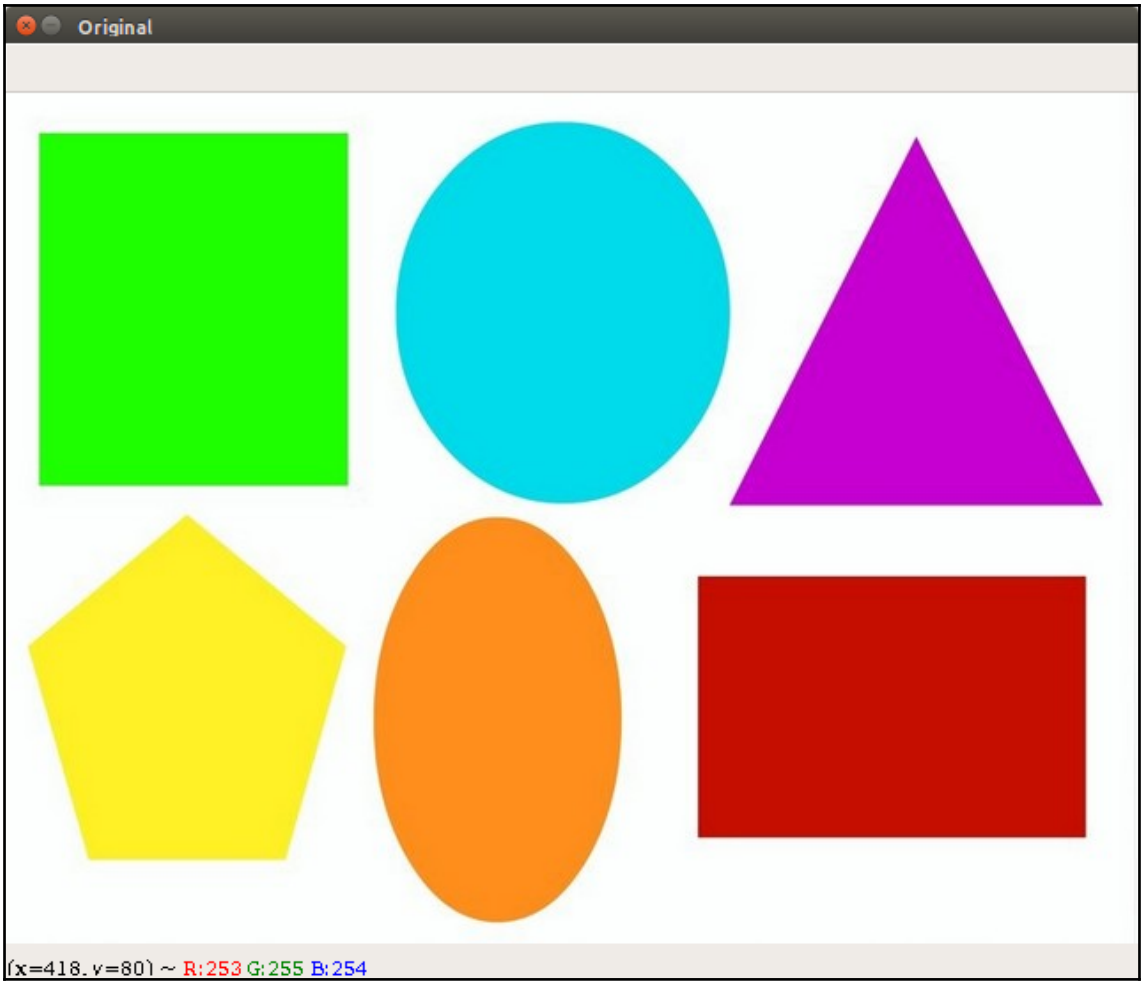

Linear Interpolated
AVENGERS

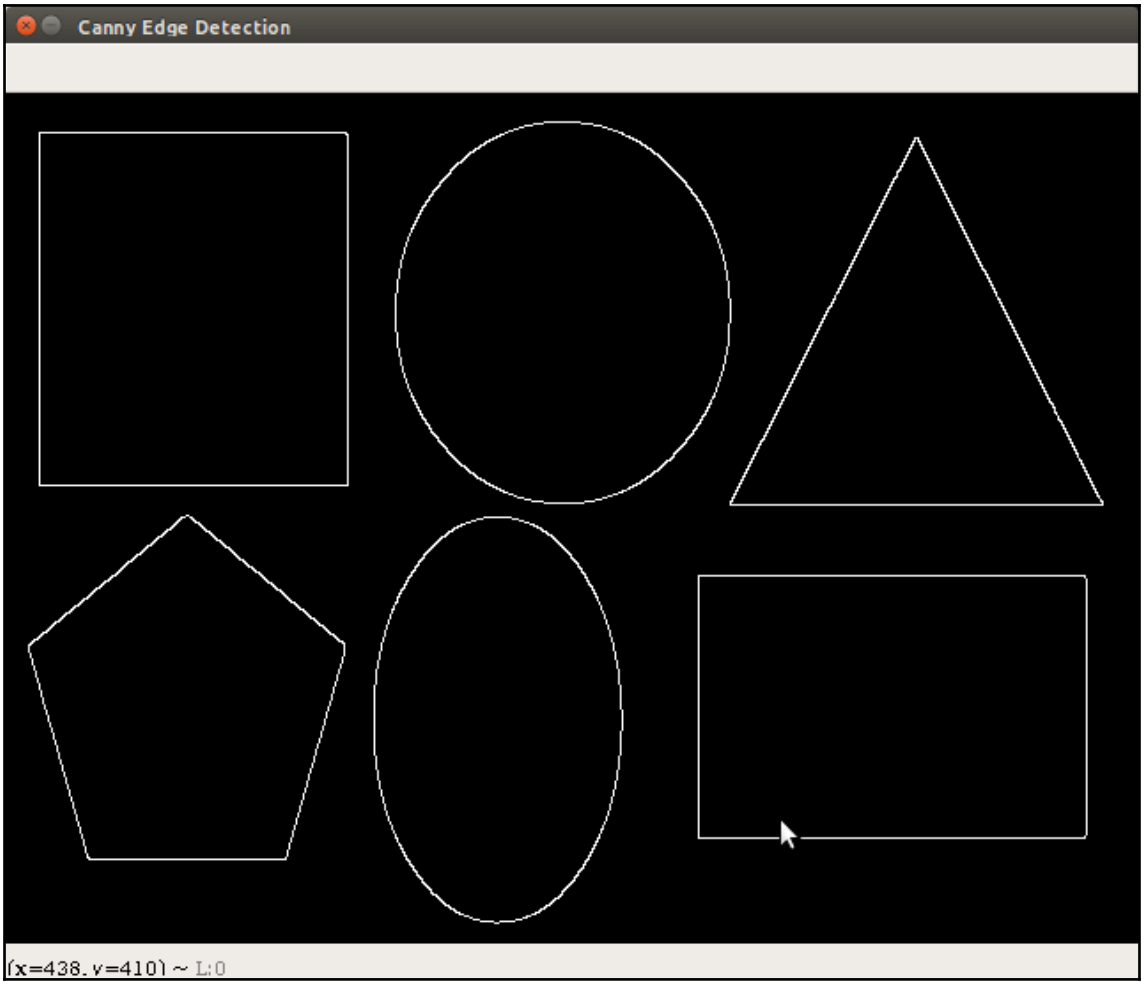

```
manju@manju-HP-Notebook:~/Documents$ python Erosion_Dilation.py
```


Original
(x=576, y=377) ~ R:247 G:247 B:247

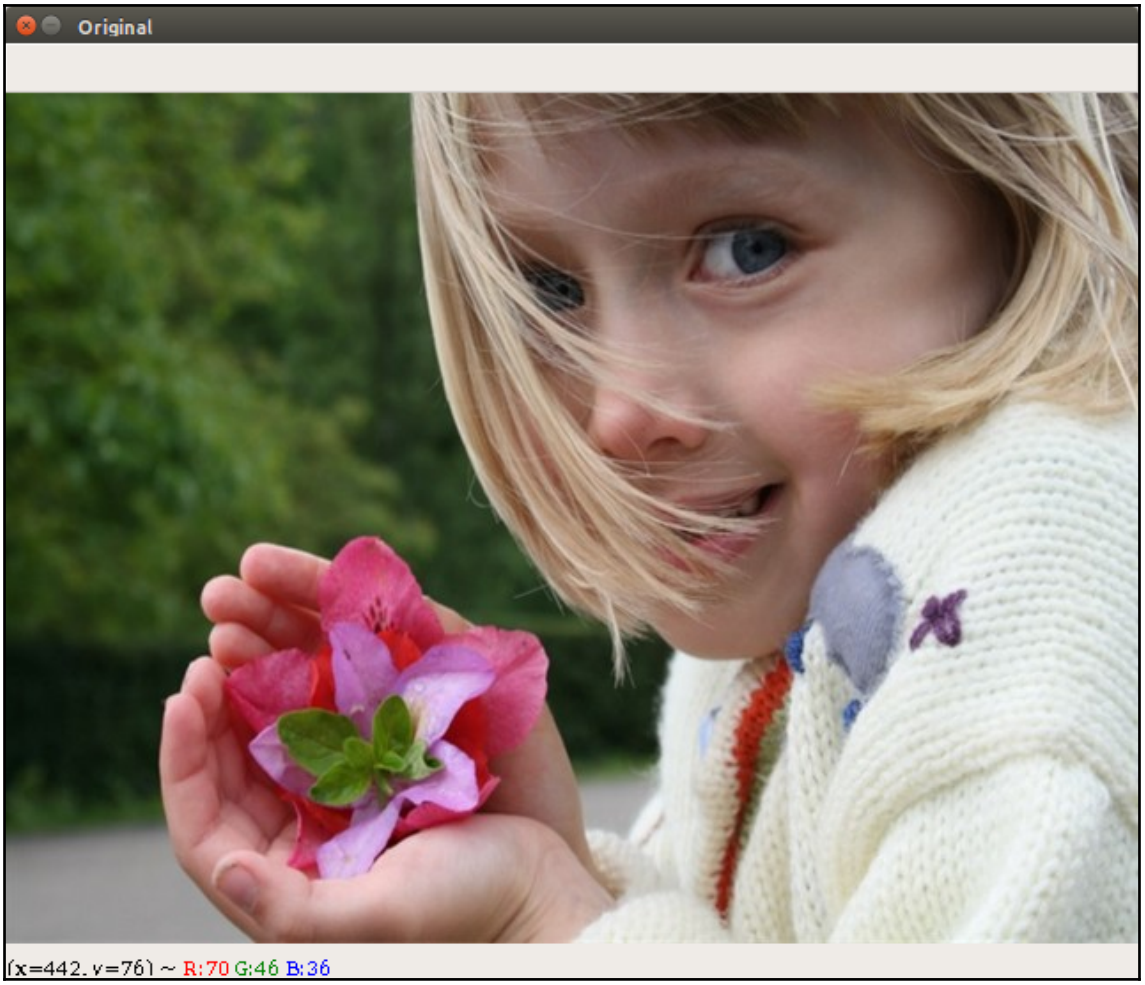

Erosion
(x=335, y=377) ~ R:243 G:243 B:243

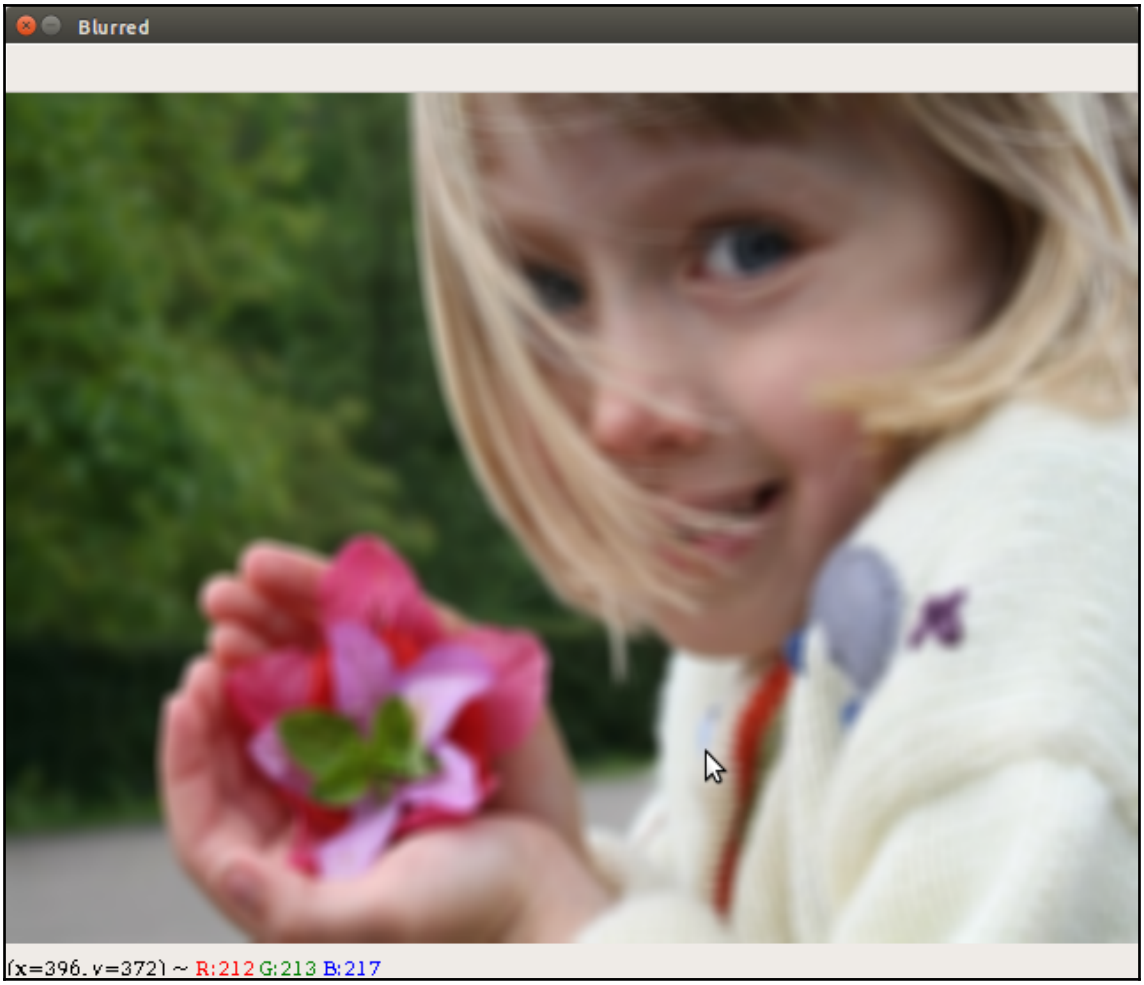

Dilation
(x=186, y=347) ~ R:172 G:172 B:172

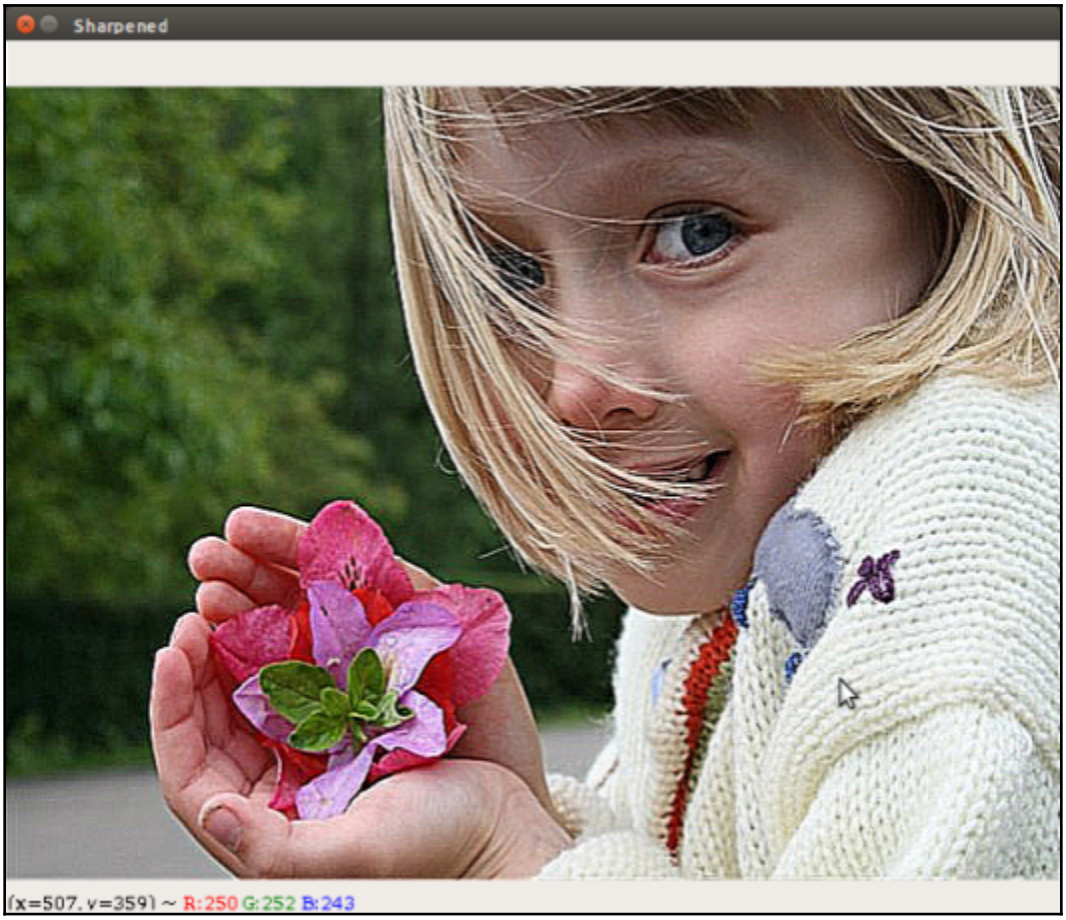

Original
(x=418, y=80) ~ R:253 G:255 B:254



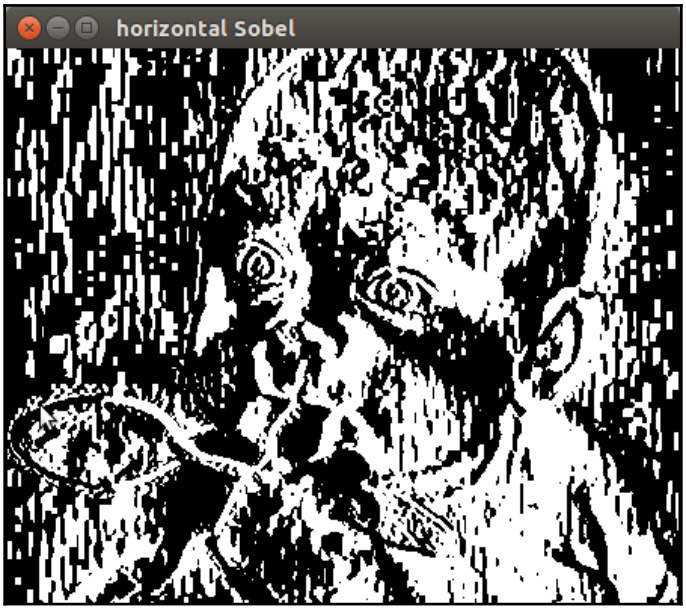

```
manju@manju-HP-Notebook:~/Documents$ python Blurring_Sharpening.py
```


Original
(x=442, y=76) ~ R:70 G:46 B:36

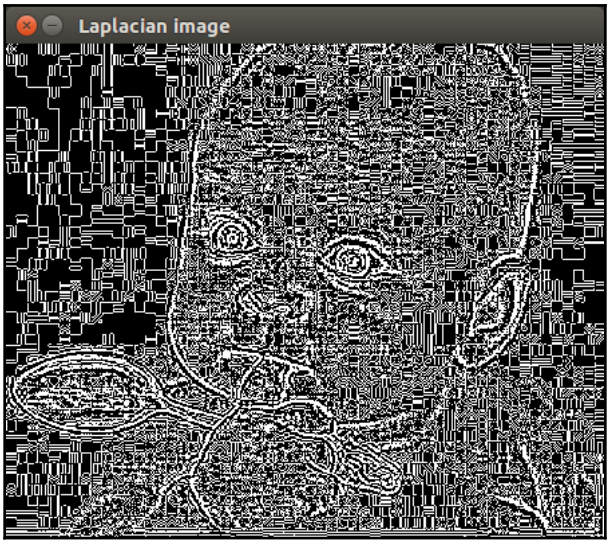

Blurred
(x=396, y=372) ~ R:212 G:213 B:217



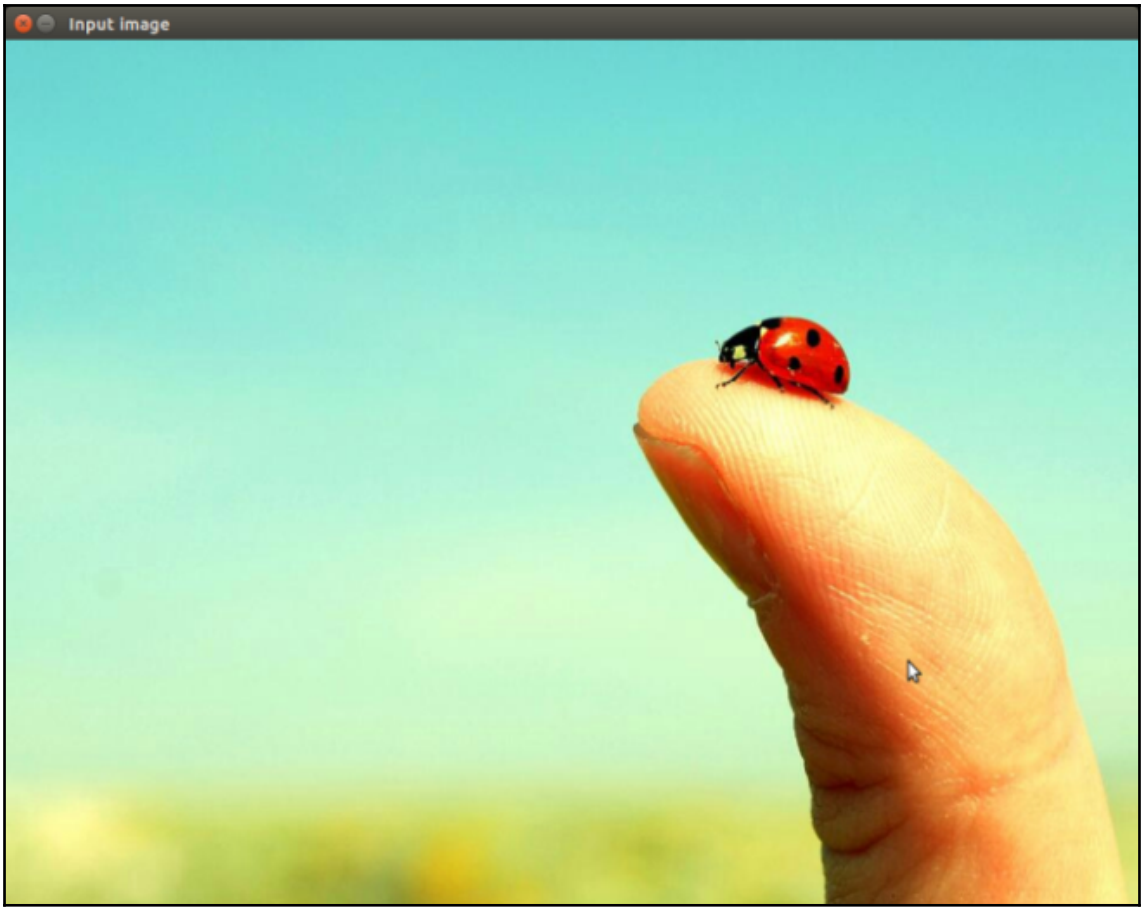

```
manju@manju-HP-Notebook:~/Documents$ python Detecting_edges.py baby.jpg
```


horizontal Sobel

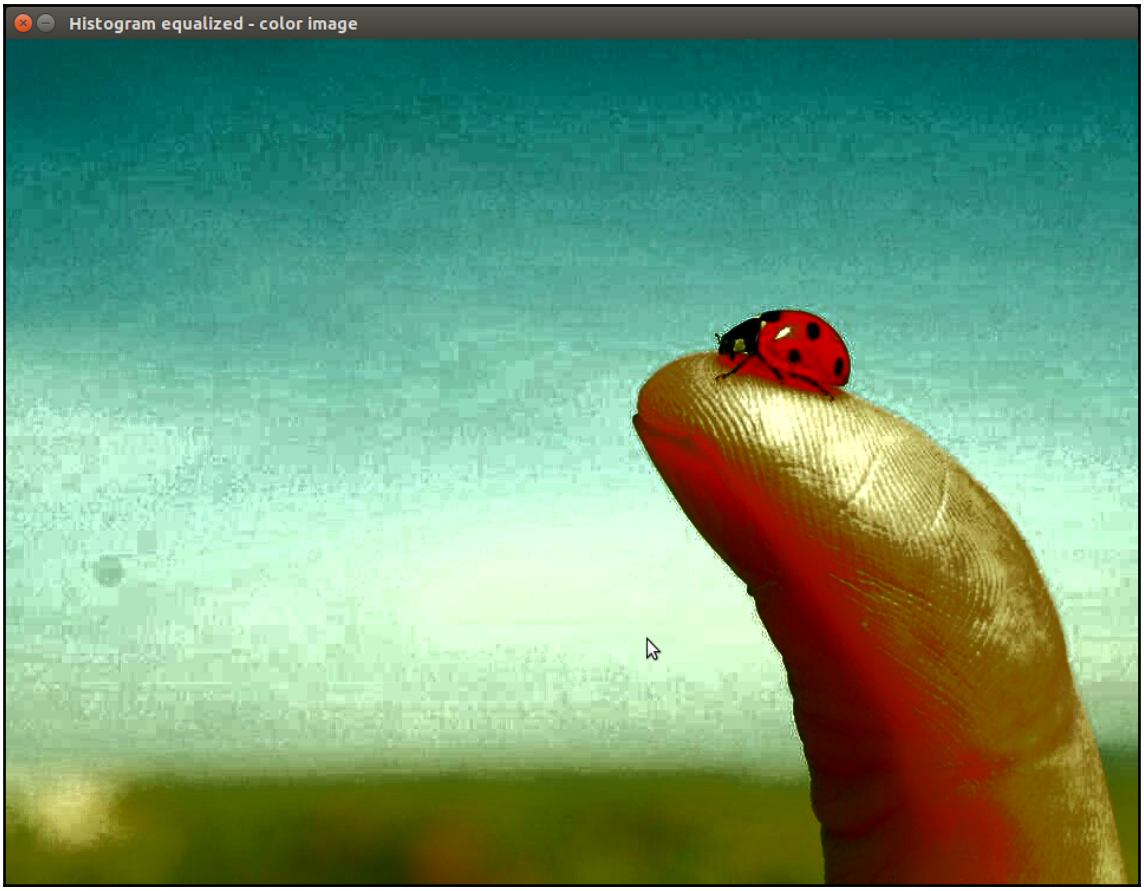

vertical Sobel




```
manju@manju-HP-Notebook:~/Documents$ python histogram.py finger.jpg
```

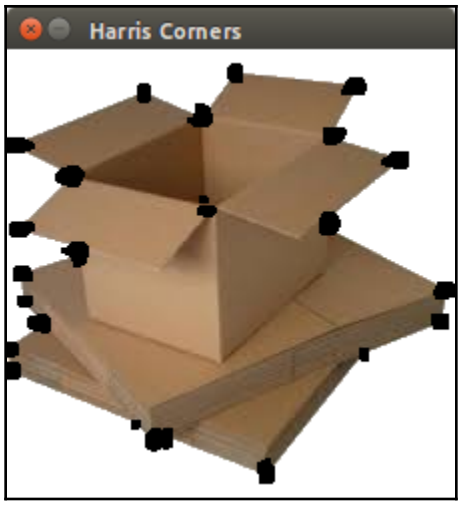

Input image


Histogram equalized - grayscale image

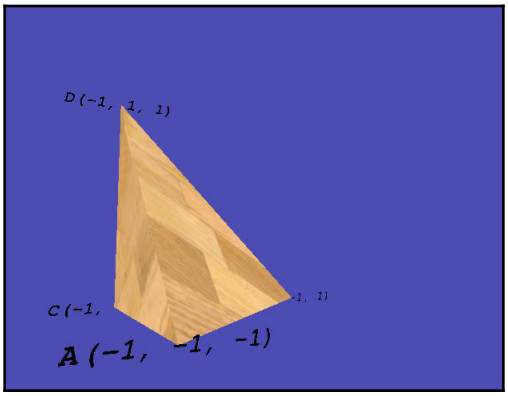


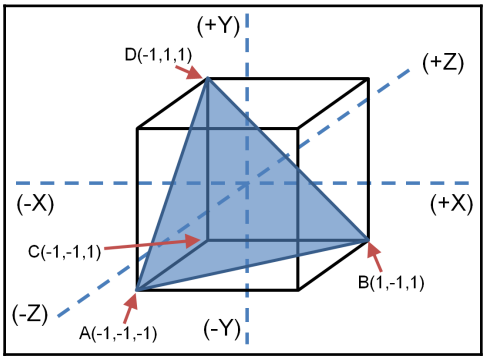

```
manju@manju-HP-Notebook:~/Documents$ python Detecting_corner.py box.jpg
```

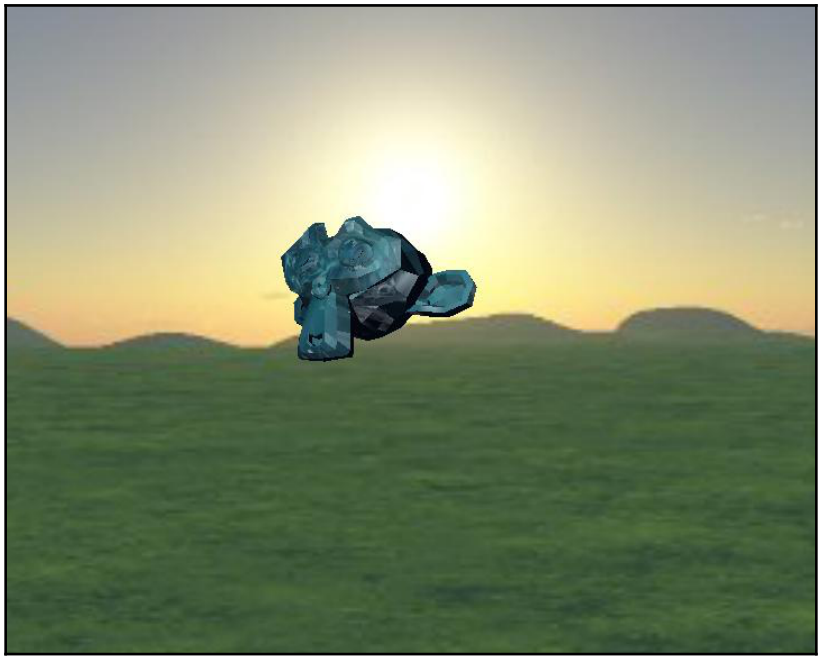

Input image

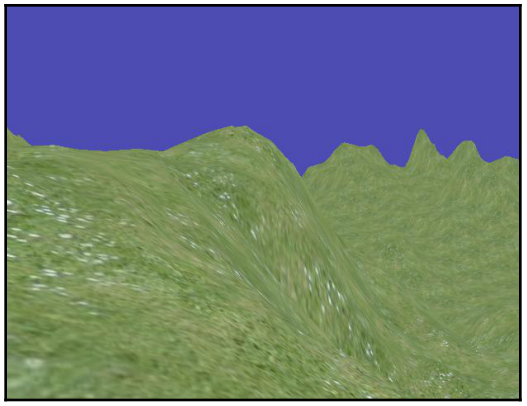

Harris Corners

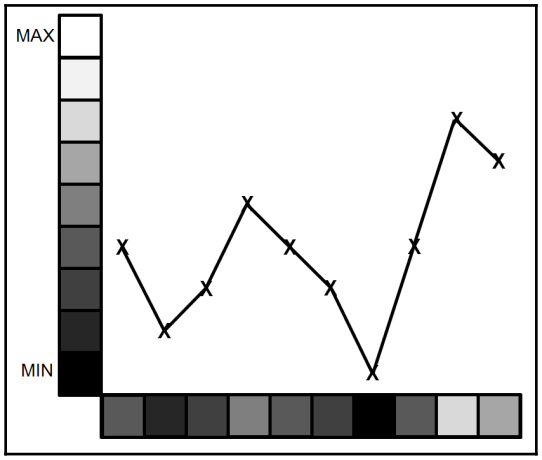
Chapter 7: Creating 3D Graphics

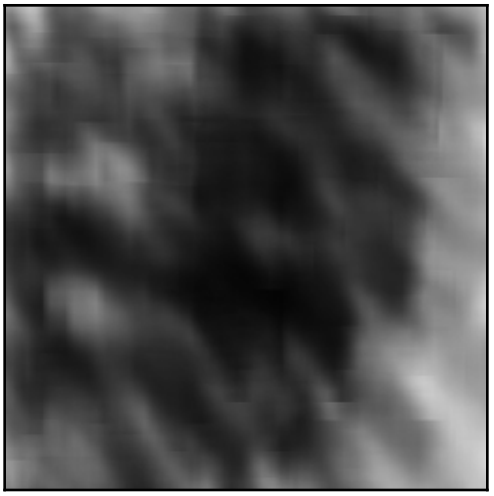


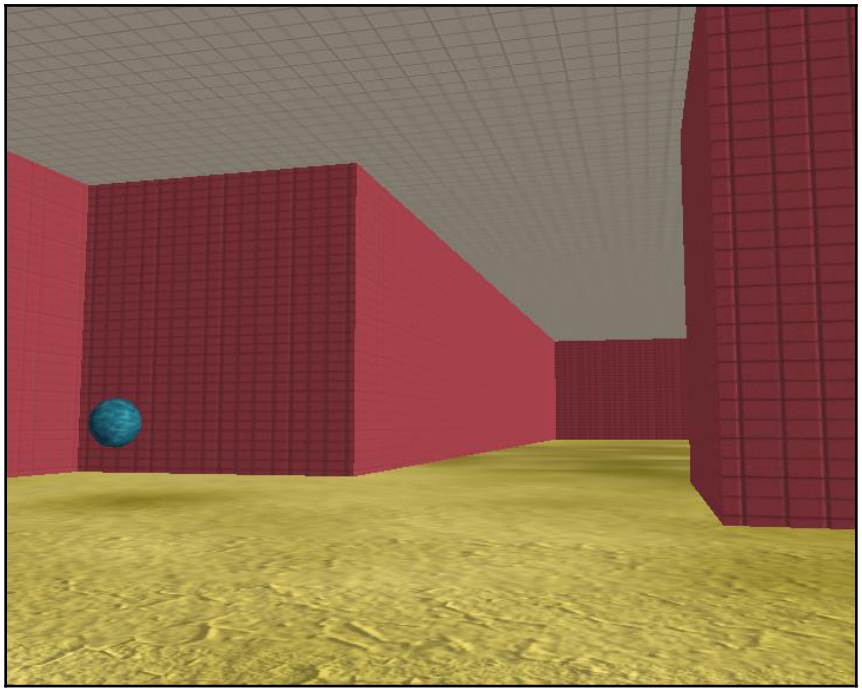


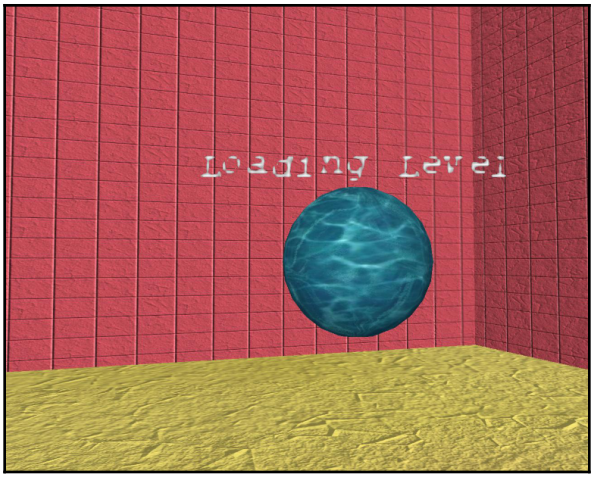


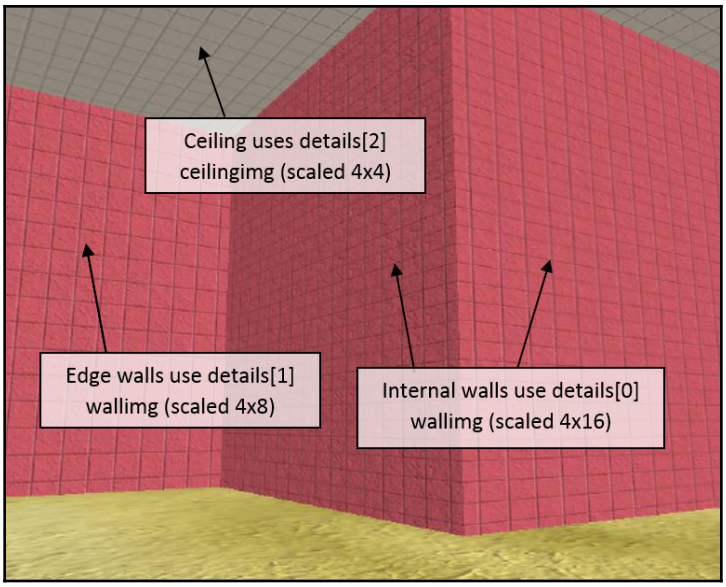


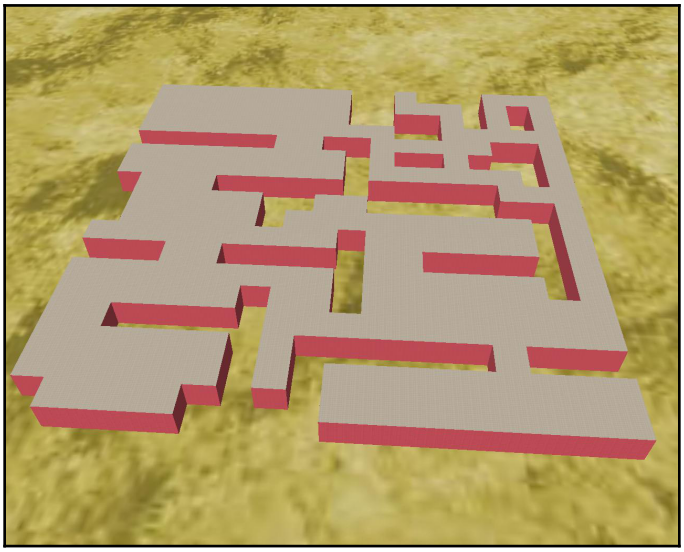

MAX
MIN



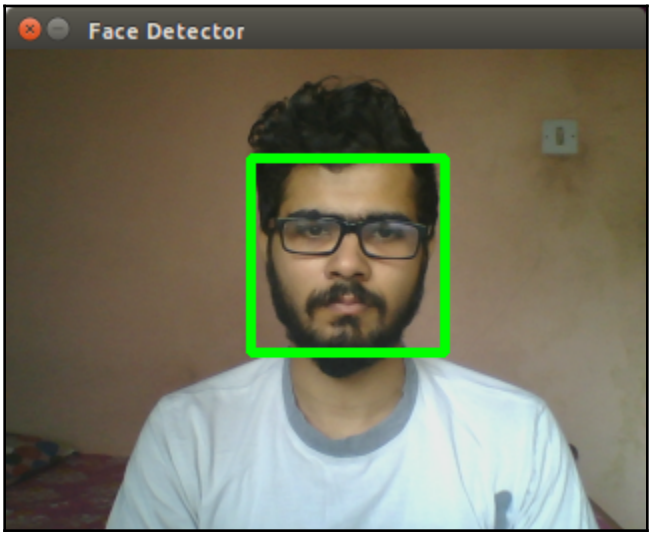



Loading Level


Ceiling uses details[2]
ceilingimg (scaled 4x4)
Edge walls use details[1]
wallimg (scaled 4x8)
Internal walls use details[0]
wallimg (scaled 4x16)

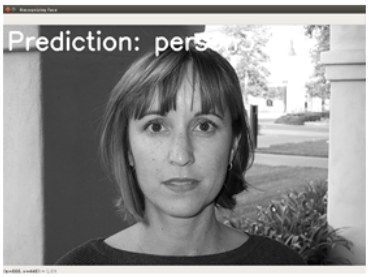


Chapter 8: Building Face Detector and Face Recognition Applications




Prediction: person1

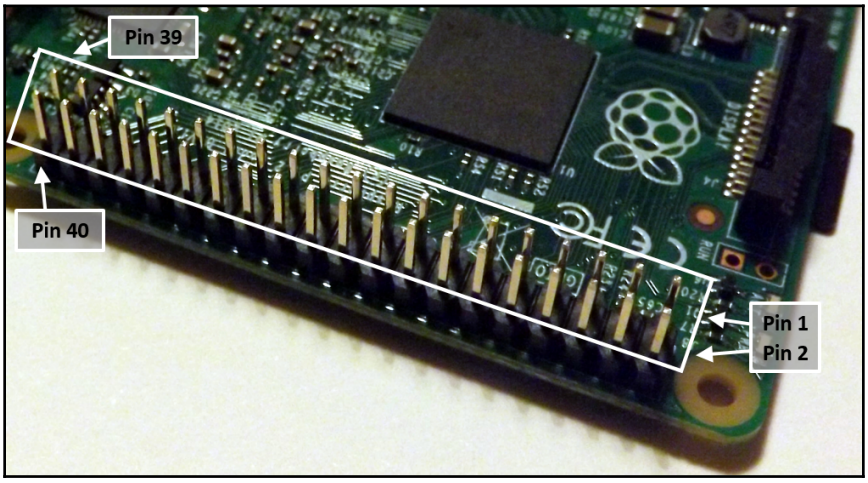

Prediction: perso


Prediction: perso


Prediction: person2

Chapter 9: Using Python to Drive Hardware

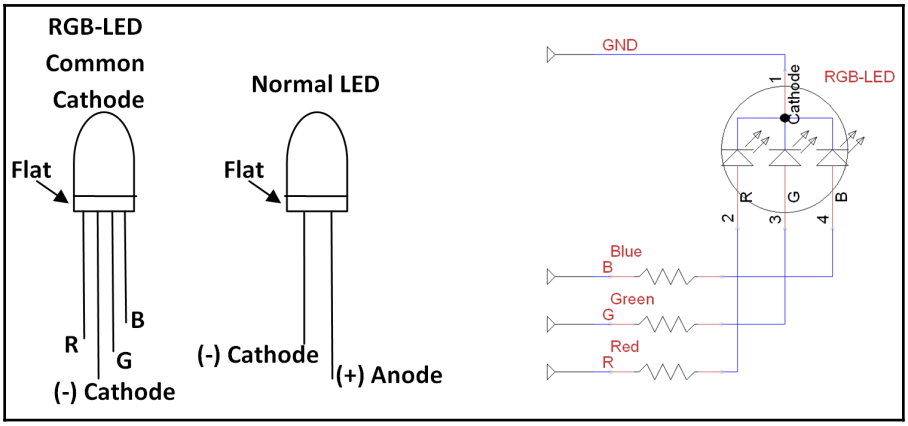
Function	GPIO.BOARD		Function
3V3	1	2	5V
SDA1 ARM	3	4	5V
SCL1 ARM	5	6	GND
	7	8	TX
GND	9	10	RX
SPI1 CE1	11	12	PWM0/SPI1 CE0
	13	14	GND
	15	16	
3v3	17	18	
SPI0 MOSI	19	20	GND
SPI0 MISO	21	22	
SPI0 SCLK	23	24	SPI0 CE0
GND	25	26	SPI0 CE1
SDA0 VC	27	28	SCL0 VC
	29	30	GND
	31	32	PWM0
PWM1	33	34	GND
SPI1 MISO/PWM1	35	36	SPI1 CE2
	37	38	SPI1 MOSI
GND	39	40	SPI1 SCLK

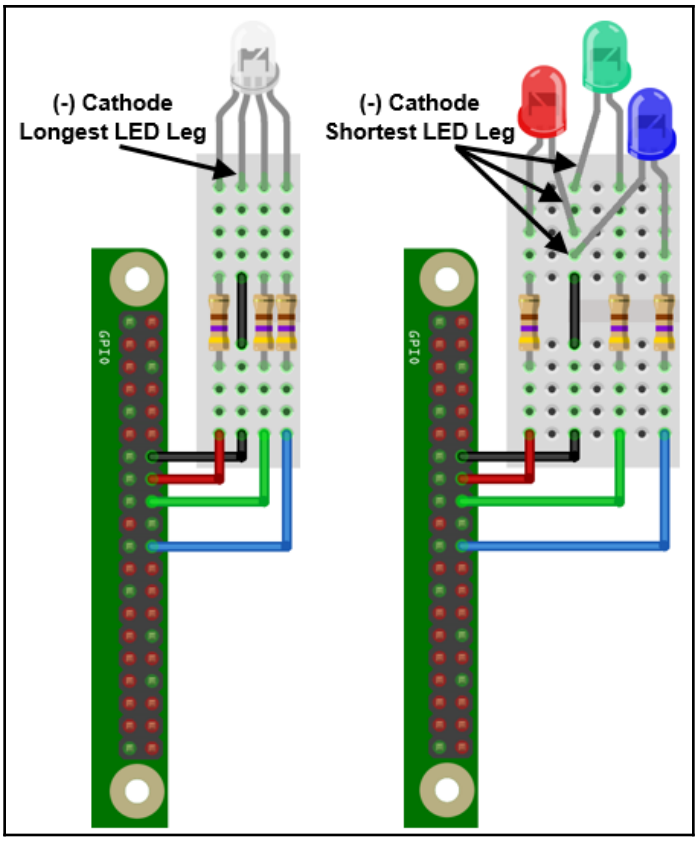


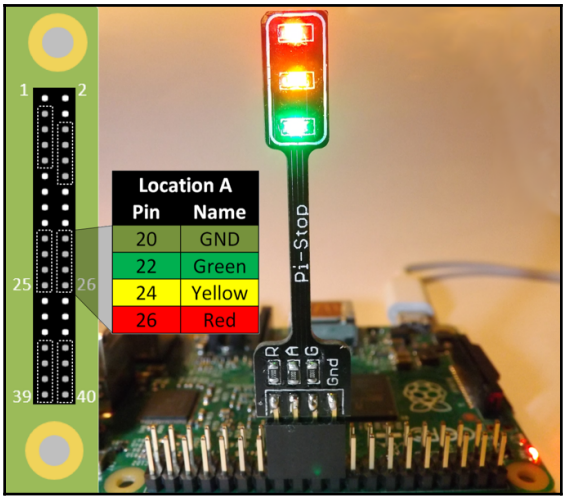
GPIO.BCM	Function	GPIO.BOARD		Function	GPIO.BCM
<50mA	3V3	1	2	5V	
BCM GPIO02	SDA1 ARM	3	4	5V	
BCM GPIO03	SCL1 ARM	5	6	GND	
BCM GPIO04		7	8	TX	BCM GPIO14
	GND	9	10	RX	BCM GPIO15
BCM GPIO17	SPI1 CE1	11	12	PWM0/SPI1 CE0	BCM GPIO18
BCM GPIO27		13	14	GND	
BCM GPIO22		15	16		BCM GPIO23
<50mA	3v3	17	18		BCM GPIO24
BCM GPIO10	SPI0 MOSI	19	20	GND	
BCM GPIO9	SPI0 MISO	21	22		BCM GPIO25
BCM GPIO11	SPI0 SCLK	23	24	SPI0 CE0	BCM GPIO08
	GND	25	26	SPI0 CE1	BCM GPIO07
BCM GPIO00	SDA0 VC	27	28	SCL0 VC	BCM GPIO01
BCM GPIO05		29	30	GND	
BCM GPIO06		31	32	PWM0	BCM GPIO 12
BCM GPIO13	PWM1	33	34	GND	
BCM GPIO19	SPI1 MISO/PWM1	35	36	SPI1 CE2	BCM GPIO16
BCM GPIO26		37	38	SPI1 MOSI	BCM GPIO20
	GND	39	40	SPI1 SCLK	BCM GPIO21

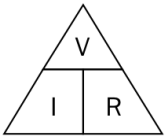
GPIO.BCM	Function	GPIO.BOARD		Function	GPIO.BCM
<50mA	3V3	2	1	5V	
BCM GPIO29	SCL0 VC	4	3	SDA0	BCM GPIO28
BCM GPIO31		6	5		BCM GPIO23
	GND	8	7	GND	

GPIO.BCM	Function	GPIO.BOARD
BCM GPIO00	SDA0	3
BCM GPIO01	SCL0	5
BCM GPIO21		13


RGB-LED
Common
Cathode
Flat
R
G
B
(-) Cathode
Normal LED
Flat
(-) Cathode
(+) Anode
GND
RGB-LED
Cathode
1
2
3
4
R
G
B
Blue
B
Green
G
Red
R


(-) Cathode
Longest LED Leg
(-) Cathode
Shortest LED Leg
GPIO
GPIO



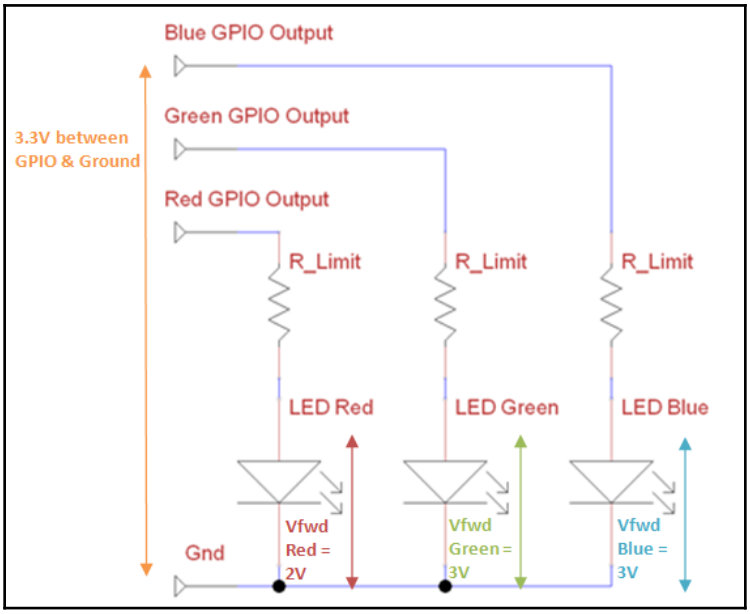


I (current through the components, amperes)

R (resistance of the component, ohms)

V (voltage across the component, volts)

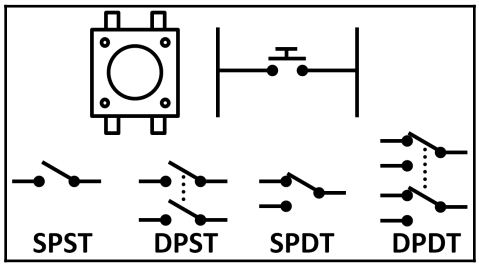
The triangle shows: $V = I \times R$ $I = \frac{V}{R}$ $R = \frac{V}{I}$

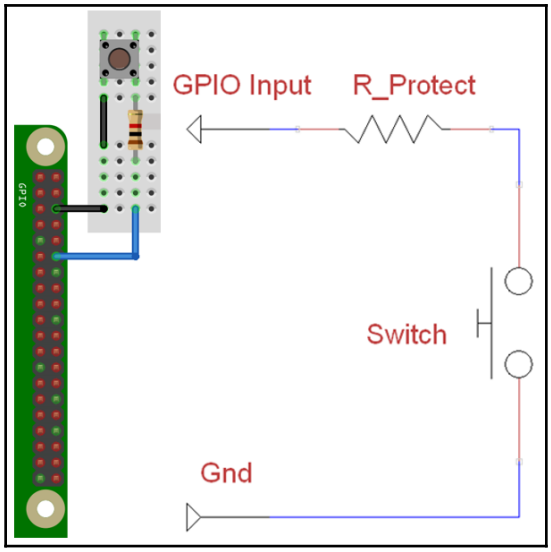


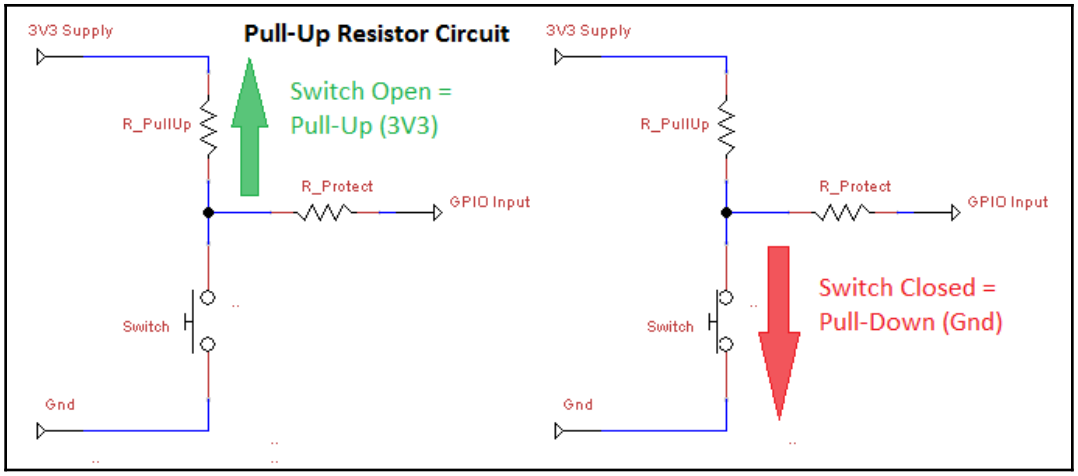
$$V_{R\_Limit} = (Vgpio - Vfwd)$$

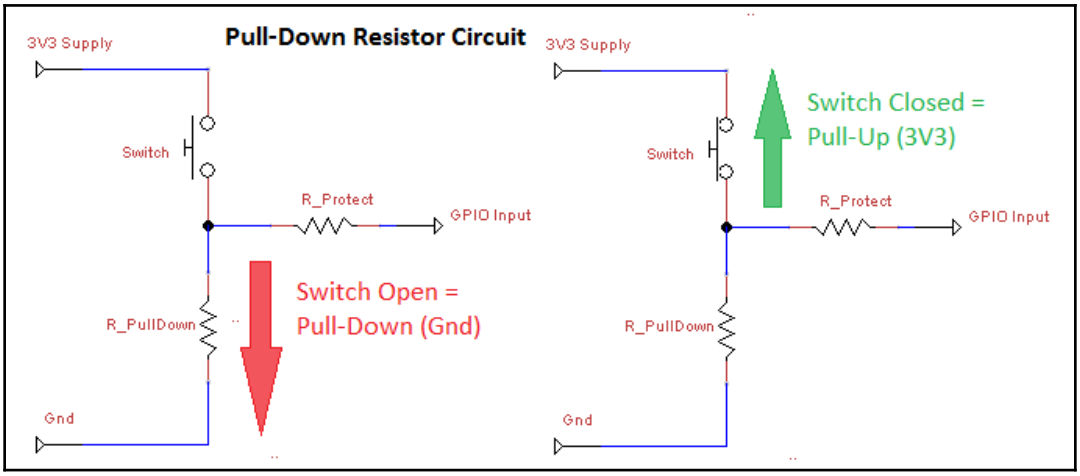
$$I = \frac{V_{R\_Limit}}{R} = \frac{(3.3-2)}{470} = \frac{1.3}{470} = 2.8\text{mA for the Red LED}$$

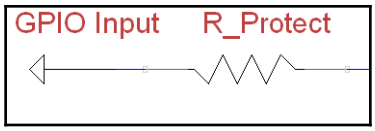
$$I = \frac{V_{R\_Limit}}{R} = \frac{(3.3-3)}{470} = \frac{0.3}{470} = 0.64\text{mA each for the Green and Blue LEDs}$$

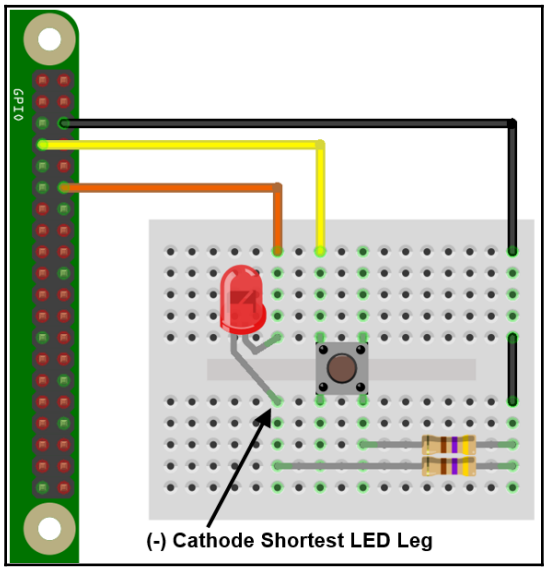


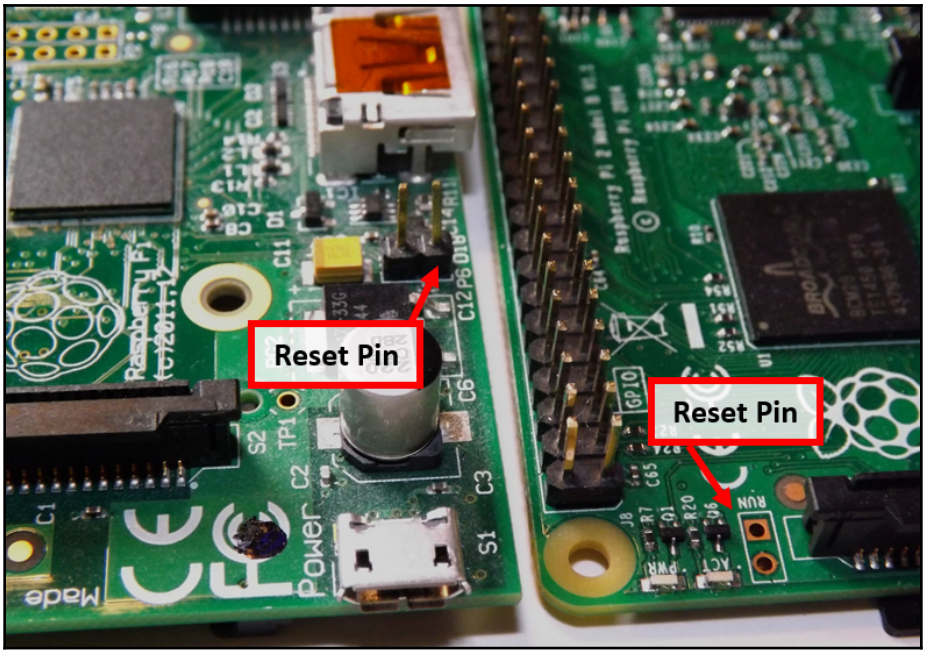

GPIO Input
R_Protect
Switch
Gnd

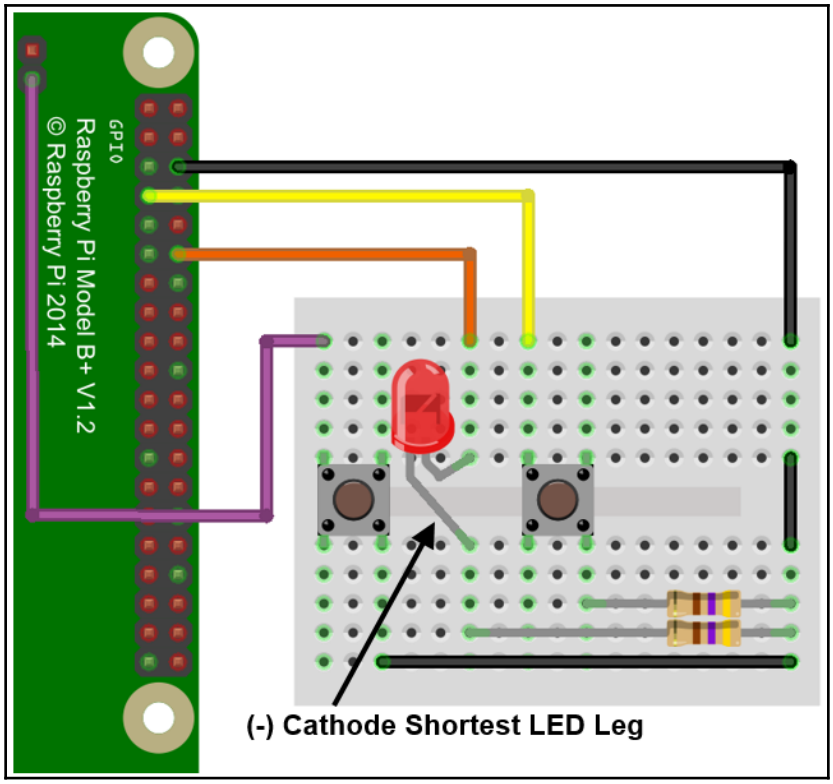

3V3 Supply
Pull-Up Resistor Circuit
R_PullUp
Switch Open =
Pull-Up (3V3)
R_Protect
GPIO Input
Switch
Gnd
3V3 Supply
R_PullUp
R_Protect
GPIO Input
Switch Closed =
Pull-Down (Gnd)
Switch
Gnd

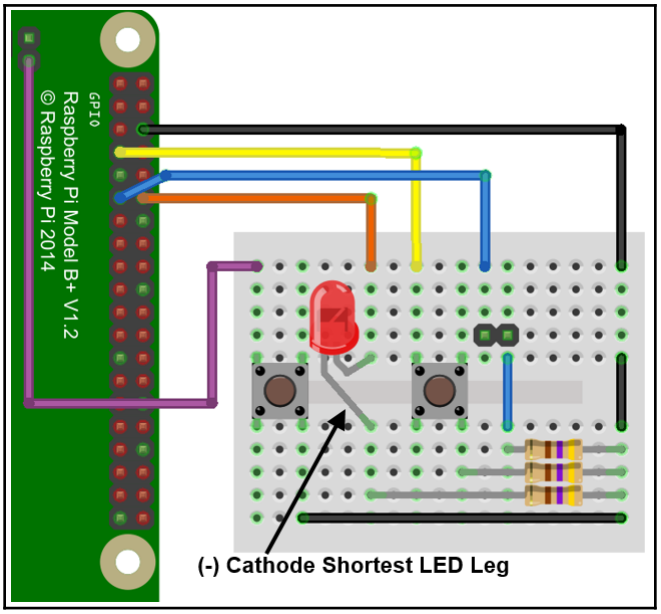

Pull-Down Resistor Circuit
3V3 Supply
Switch
R_Protect
GPIO Input
R_PullDown
Gnd
Switch Open =
Pull-Down (Gnd)
3V3 Supply
Switch
Switch Closed =
Pull-Up (3V3)
R_Protect
GPIO Input
R_PullDown
Gnd

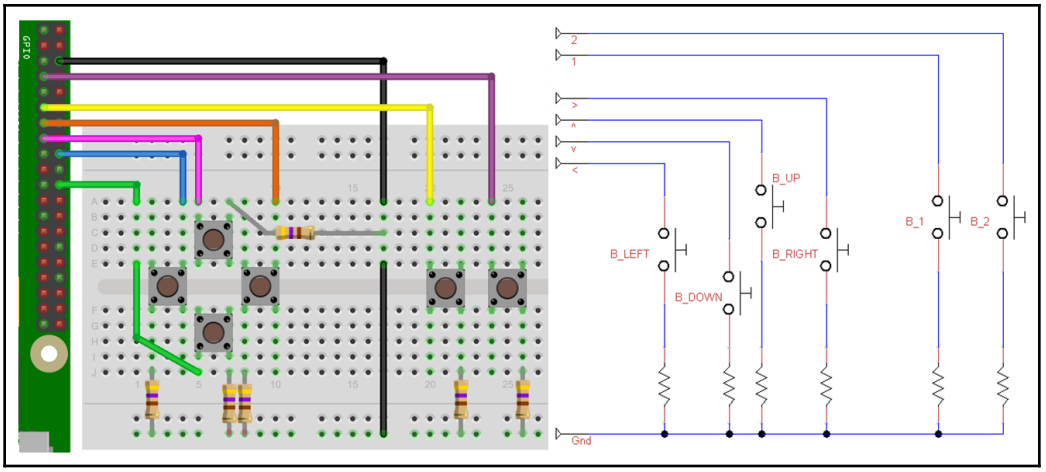

GPIO Input
R_Protect

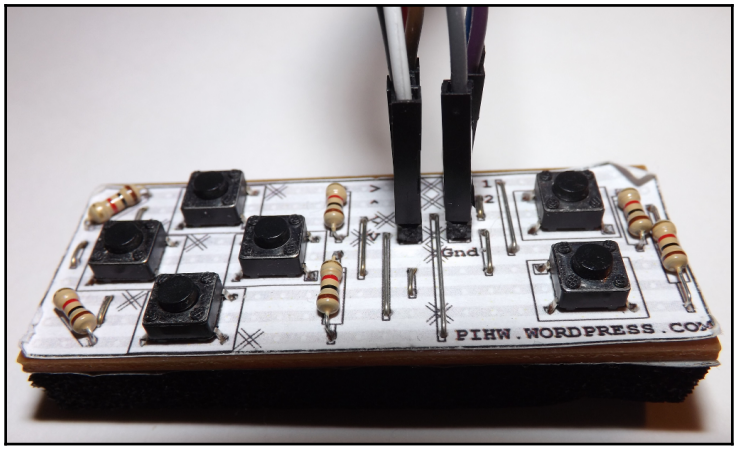

GPIO
(-) Cathode Shortest LED Leg

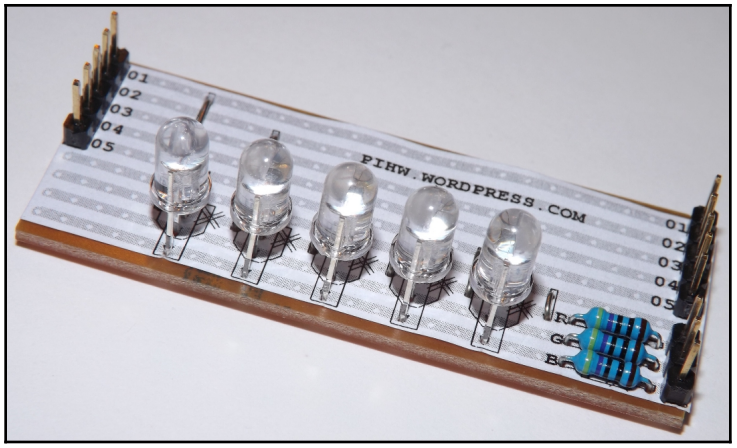

Reset Pin
Reset Pin

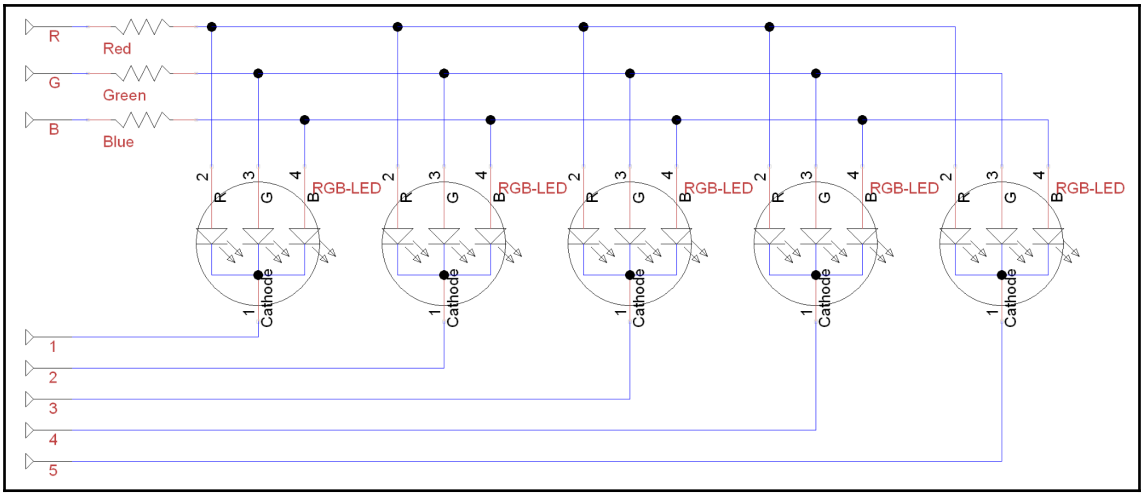

GPIO
Raspberry Pi Model B+ V1.2
© Raspberry Pi 2014
(-) Cathode Shortest LED Leg


GPIO
Raspberry Pi Model B+ V1.2
© Raspberry Pi 2014
(-) Cathode Shortest LED Leg

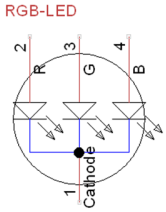

GPIO
2
1
>
^
v
<
B_UP
B_LEFT
B_RIGHT
B_DOWN
B_1
B_2
Gnd


Gnd
PIHW.WORDPRESS.COM

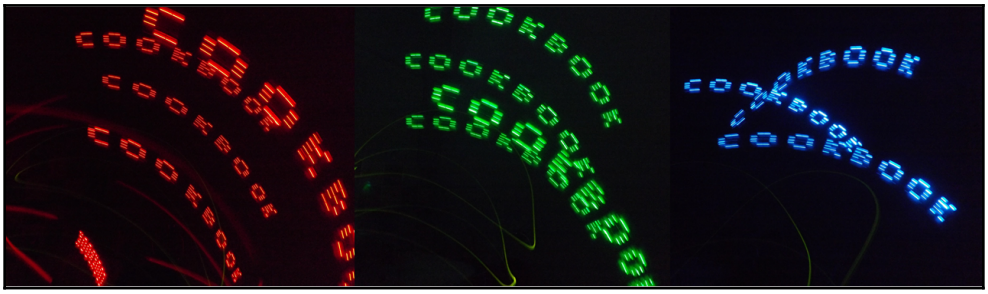

01
02
03
04
05
PIHW.WORDPRESS.COM

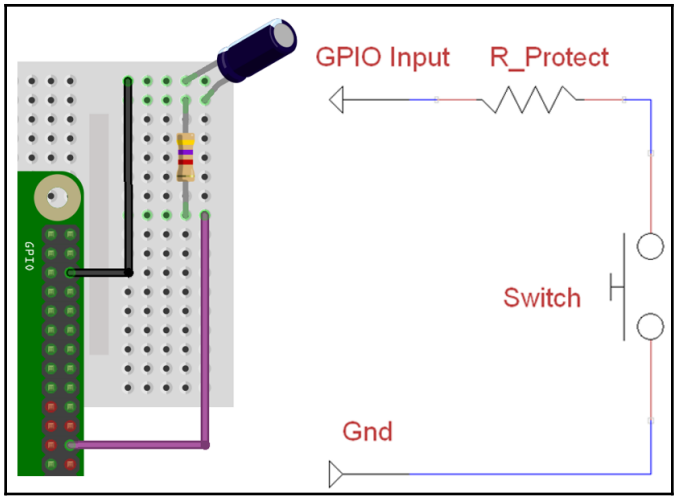


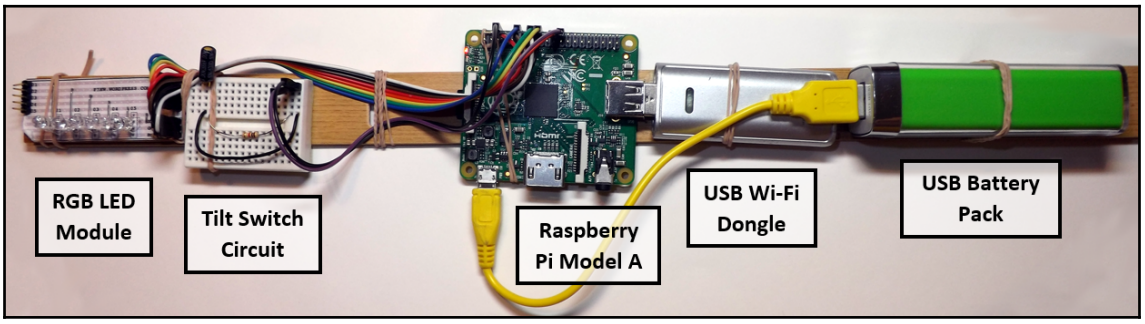
Red Green Blue	000	001	010	011	100	101	110	111
LED State	OFF	Blue	Green	Cyan	Red	Magenta	Yellow	White

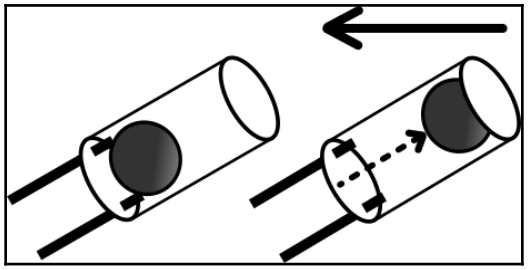


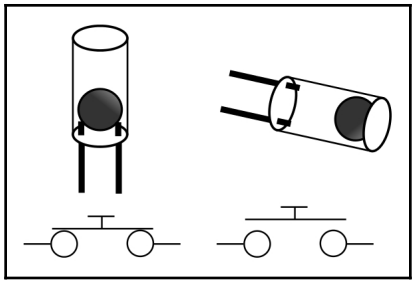
Cathode (1-5)	RGB Pins	Result	Status
HIGH	HIGH	LED OFF	LED "Disabled"
HIGH	LOW	LED OFF	
LOW	HIGH	LED ON	LED "Enabled"
LOW	LOW	LED OFF	

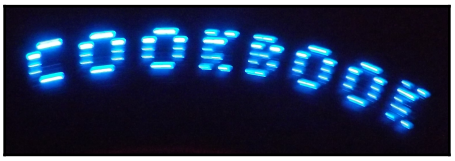



GPIO Input
R_Protect
Switch
Gnd
GPIO

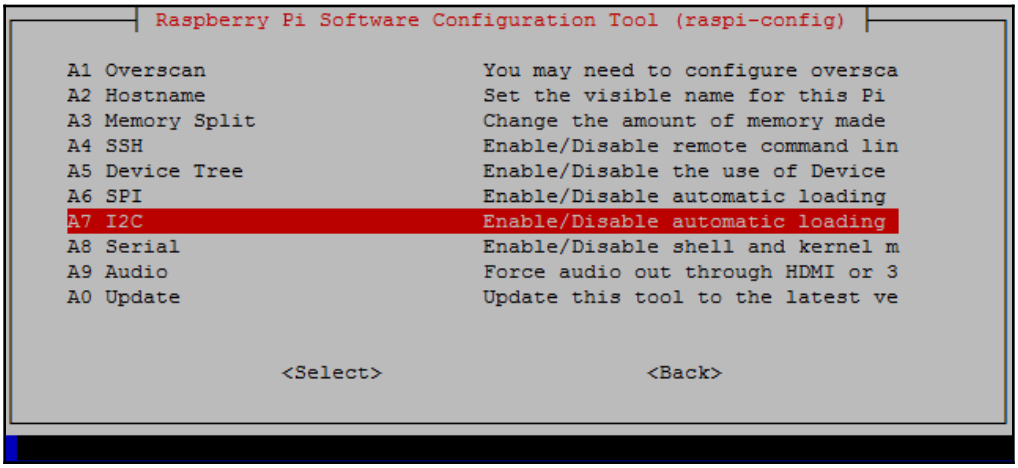

RGB LED Module
Tilt Switch Circuit
Raspberry Pi Model A
USB Wi-Fi Dongle
USB Battery Pack

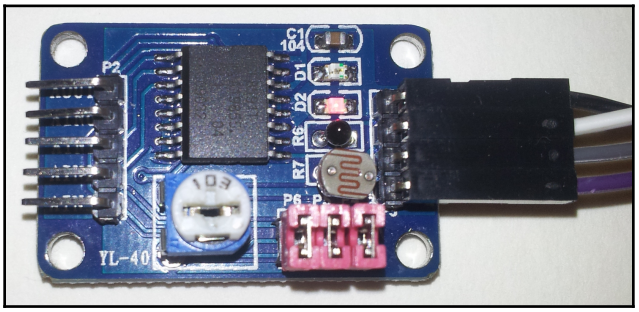




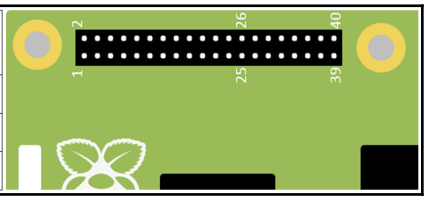


Chapter 10: Sensing and Displaying Real-World Data

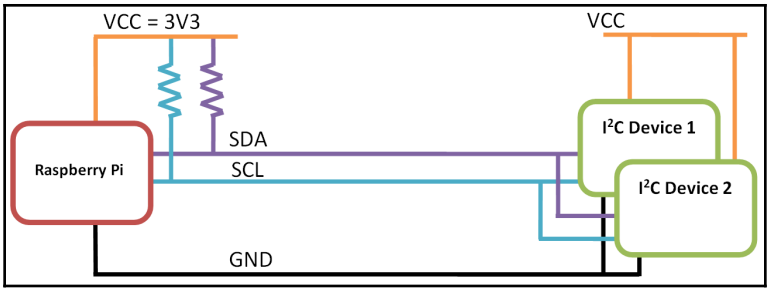


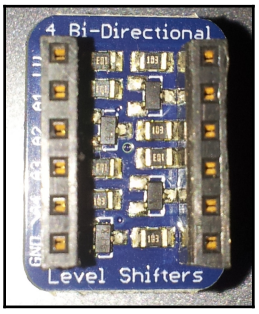


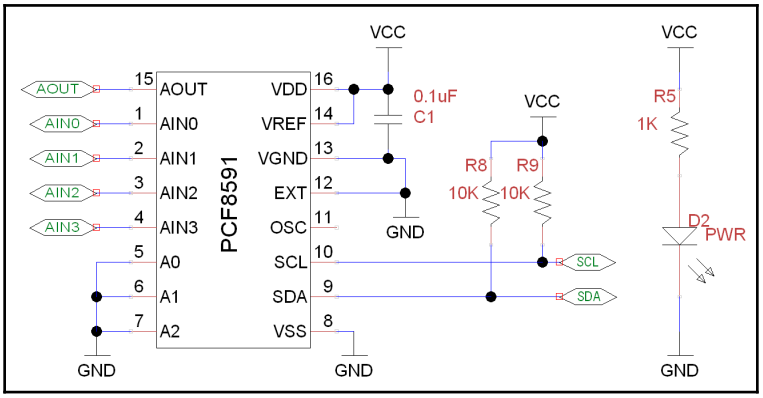
I²C Device	Raspberry Pi GPIO		I²C Device
VCC	1	2	
SDA	3	4	
SCL	5	6	GND

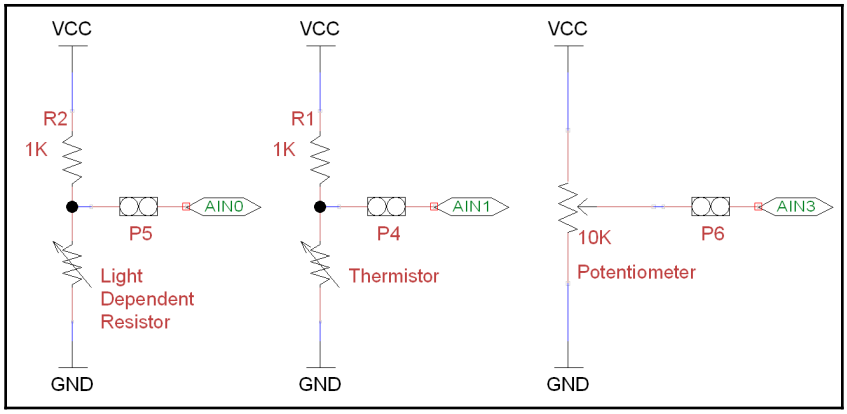


```
pi@raspberrypi:~$ sudo i2cdetect -y 0
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
pi@raspberrypi:~$ sudo i2cdetect -y 1
     0  1  2  3  4  5  6  7  8  9  a  b  c  d  e  f
00:          -- -- -- -- -- -- -- -- -- -- -- -- --
10: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
20: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
30: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
40: -- -- -- -- -- -- -- -- 48 -- -- -- -- -- -- --
50: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
60: -- -- -- -- -- -- -- -- -- -- -- -- -- -- -- --
70: -- -- -- -- -- -- -- --
pi@raspberrypi:~$
```



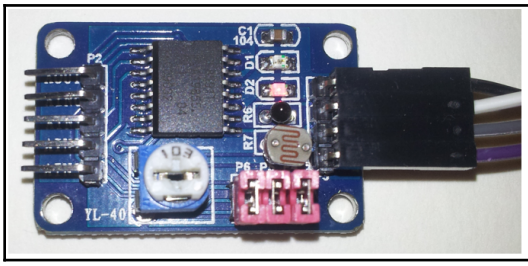






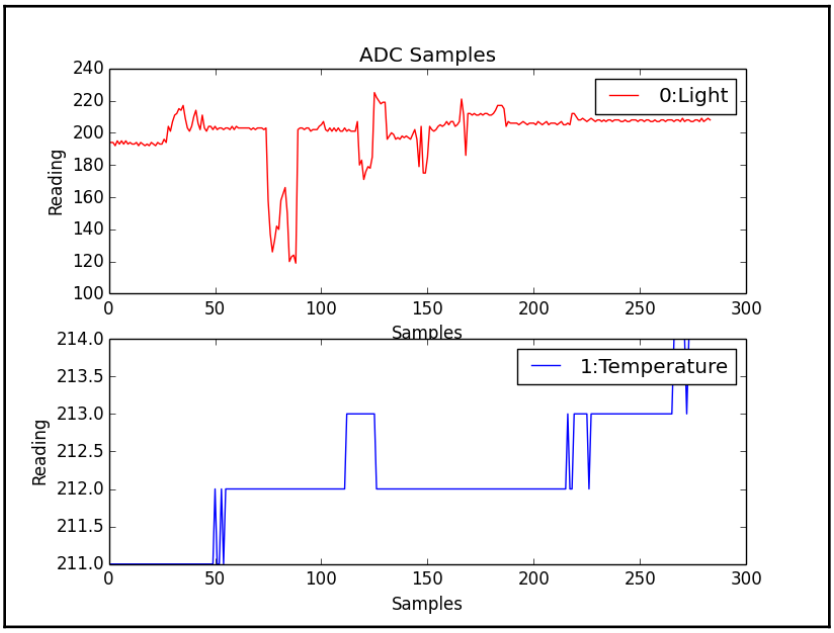
$$V_{out} = \frac{R_t}{(R_t + R_b)} \times VCC$$

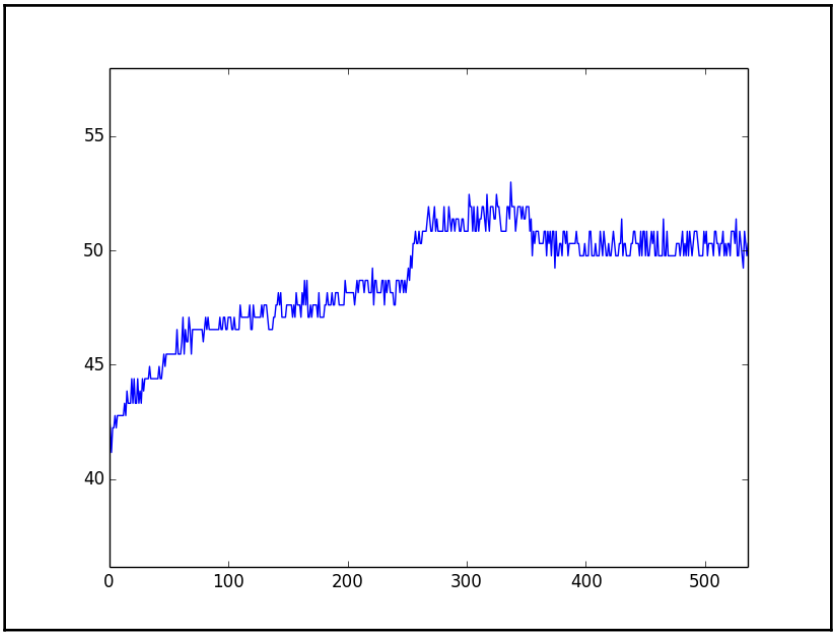
```
ngPi/wiringPi/wiringSerial.o build/temp.linux-armv6l-3.2/WiringPi/wiringPi/wirin
gShift.o build/temp.linux-armv6l-3.2/wiringpi_wrap.o -o build/lib.linux-armv6l-3
.2/_wiringpi2.cpython-32mu.so

Successfully installed wiringpi2
Cleaning up...
pi@raspberrypi:~$
```

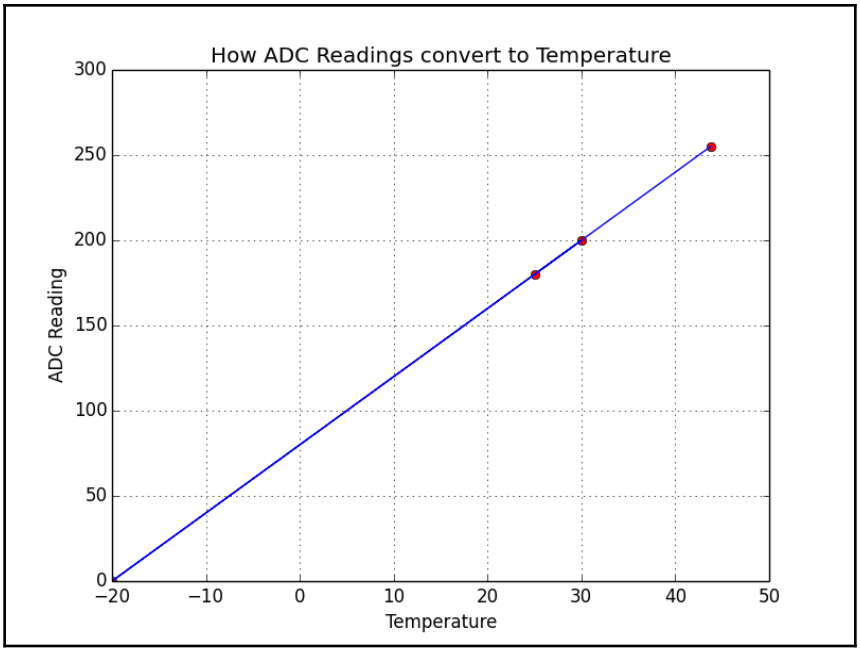


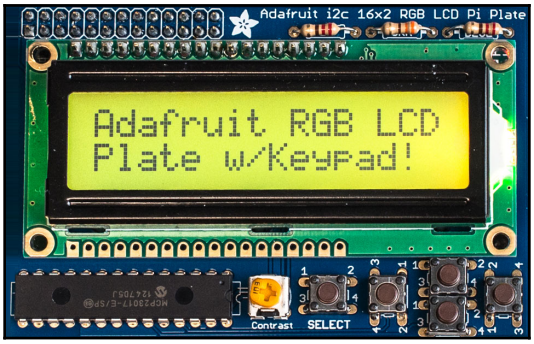
I²C Device	Raspberry Pi GPIO		I²C Device
VCC	1	2	
SDA	3	4	
SCL	5	6	GND

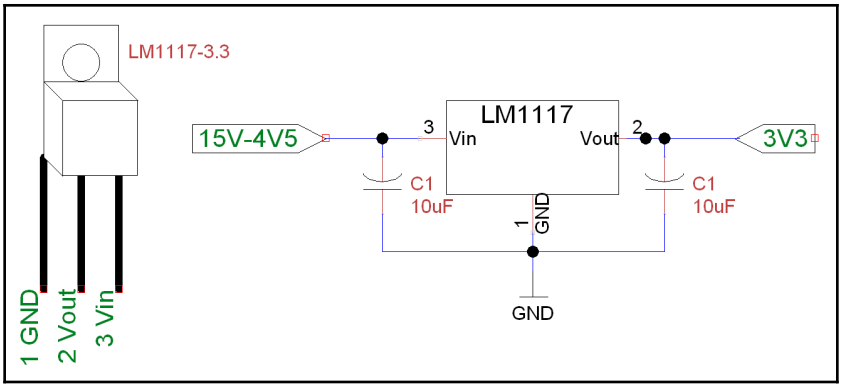
	Time	0:Light	1:Temperature	2:External	3:Potentiometer
1	2014-02-20 21:24:15	207.00000	216.00000	130.00000	255.00000
2	2014-02-20 21:24:16	207.00000	216.00000	152.00000	255.00000
3	2014-02-20 21:24:17	207.00000	216.00000	145.00000	255.00000
4	2014-02-20 21:24:18	207.00000	216.00000	123.00000	255.00000
5	2014-02-20 21:24:19	207.00000	216.00000	128.00000	255.00000

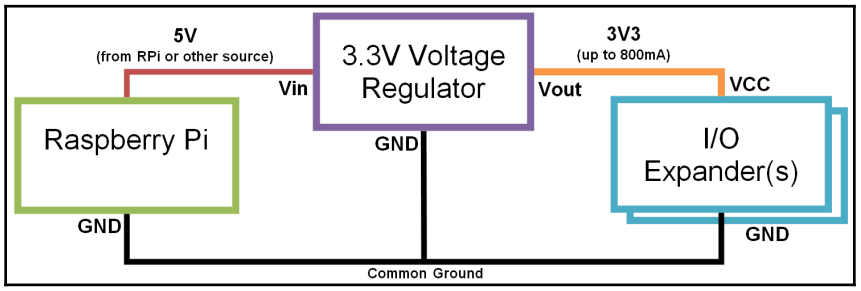


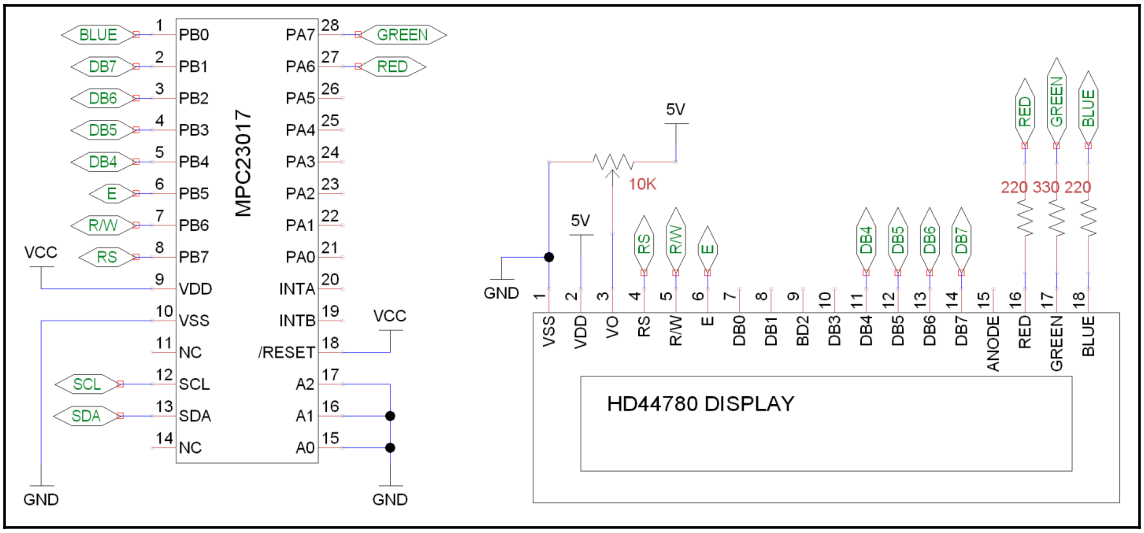

55
50
45
40
0
100
200
300
400
500


How ADC Readings convert to Temperature
ADC Reading
Temperature
300
250
200
150
100
50
0
−20
−10
0
10
20
30
40
50


Adafruit i2c 16x2 RGB LCD Pi Plate
Adafruit RGB LCD
Plate w/Keypad!
Contrast
SELECT


LM1117-3.3
1 GND
2 Vout
3 Vin
15V-4V5
3
Vin
LM1117
Vout
2
3V3
C1
10uF
C1
10uF
1
GND
GND


5V
(from RPi or other source)
Vin
3.3V Voltage
Regulator
3V3
(up to 800mA)
Vout
VCC
Raspberry Pi
GND
I/O
Expander(s)
GND
GND
Common Ground



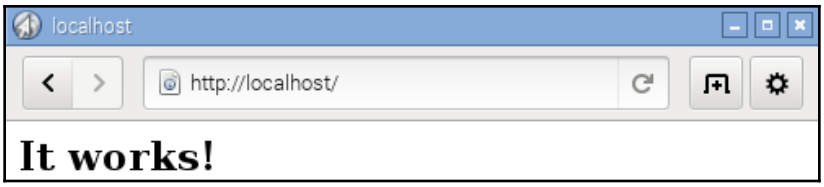
	Date	Time	Name	Value
0	2015-07-03	21:02:54	0:Light	210
1	2015-07-03	21:02:54	1:Temperature	210
2	2015-07-03	21:02:54	2:External	107
3	2015-07-03	21:02:54	3:Potentiometer	40
4	2015-07-03	21:02:55	0:Light	211
5	2015-07-03	21:02:55	1:Temperature	210
6	2015-07-03	21:02:55	2:External	156
7	2015-07-03	21:02:55	3:Potentiometer	39

Press button to remove the table data

Delete

Recorded Data

2015-08-06 21:45:49 System_Temp 43850
2015-08-06 21:45:50 System_Temp 43850
2015-08-06 21:45:51 System_Temp 43312
2015-08-06 21:45:52 System_Temp 43850
2015-08-06 21:45:53 System_Temp 43312
2015-08-06 21:45:54 System_Temp 43850
2015-08-06 21:45:55 System_Temp 43312
2015-08-06 21:45:56 System_Temp 43312
2015-08-06 21:45:57 System_Temp 43850
2015-08-06 21:45:59 System_Temp 43312
2015-08-06 21:46:10 1:Temperature 211
2015-08-06 21:46:12 1:Temperature 212
2015-08-06 21:46:14 1:Temperature 212
2015-08-06 21:46:16 1:Temperature 212
2015-08-06 21:46:18 1:Temperature 211
2015-08-06 21:46:20 1:Temperature 212
2015-08-06 21:46:22 1:Temperature 212
2015-08-06 21:46:24 1:Temperature 211
2015-08-06 21:46:26 1:Temperature 211
2015-08-06 21:46:28 1:Temperature 212
Done

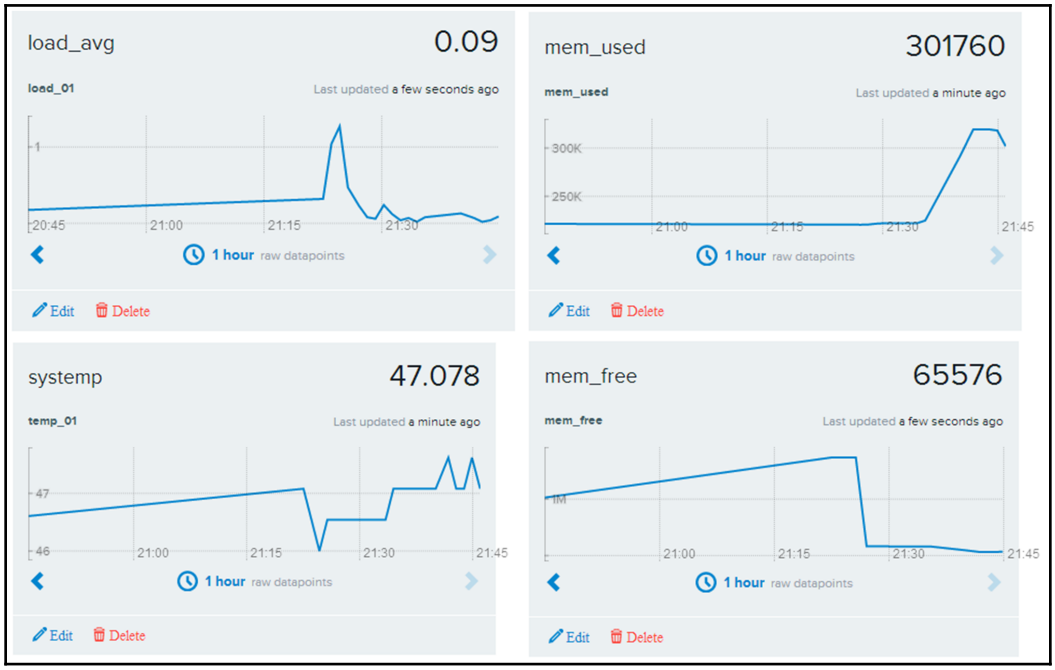


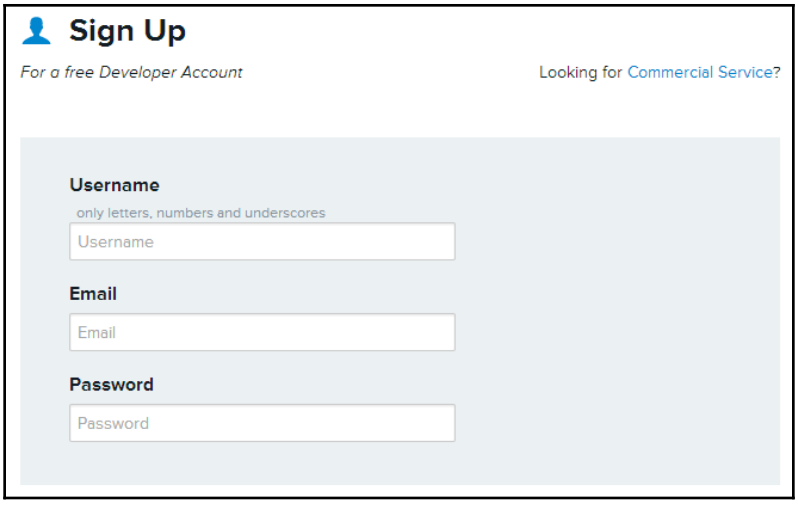
PHP Version 5.4.41-0+deb7u1

System	Linux raspberrypi 3.18.11-v7+ #781 SMP PREEMPT Tue Apr 21 18:07:59 BST 2015 armv7l
Build Date	Jun 7 2015 23:43:27
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php5/apache2
Loaded Configuration File	/etc/php5/apache2/php.ini
Scan this dir for additional .ini files	/etc/php5/apache2/conf.d
Additional .ini files parsed	/etc/php5/apache2/conf.d/10-pdo.ini, /etc/php5/apache2/conf.d/20-mysql.ini, /etc/php5/apache2/conf.d/20-mysqli.ini, /etc/php5/apache2/conf.d/20-pdo_mysql.ini, /etc/php5/apache2/conf.d/20-pdo_sqlite.ini, /etc/php5/apache2/conf.d/20-sqlite3.ini
PHP API	20100412
PHP Extension	20100525
Zend Extension	220100525
Zend	API220100525,NTS

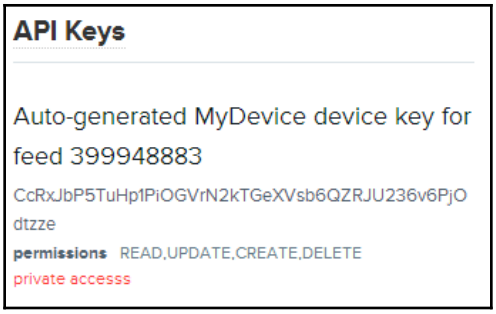
Remove all the data in the table.
Result: DELETED DATA

Press button to return to data display.
Return


load_avg
0.09
load_01
Last updated a few seconds ago
1
20:45
21:00
21:15
21:30
1 hour raw datapoints
Edit
Delete
mem_used
301760
mem_used
Last updated a minute ago
300K
250K
21:00
21:15
21:30
21:45
1 hour raw datapoints
Edit
Delete
systemp
47.078
temp_01
Last updated a minute ago
47
46
21:00
21:15
21:30
21:45
1 hour raw datapoints
Edit
Delete
mem_free
65576
mem_free
Last updated a few seconds ago
1M
21:00
21:15
21:30
21:45
1 hour raw datapoints
Edit
Delete

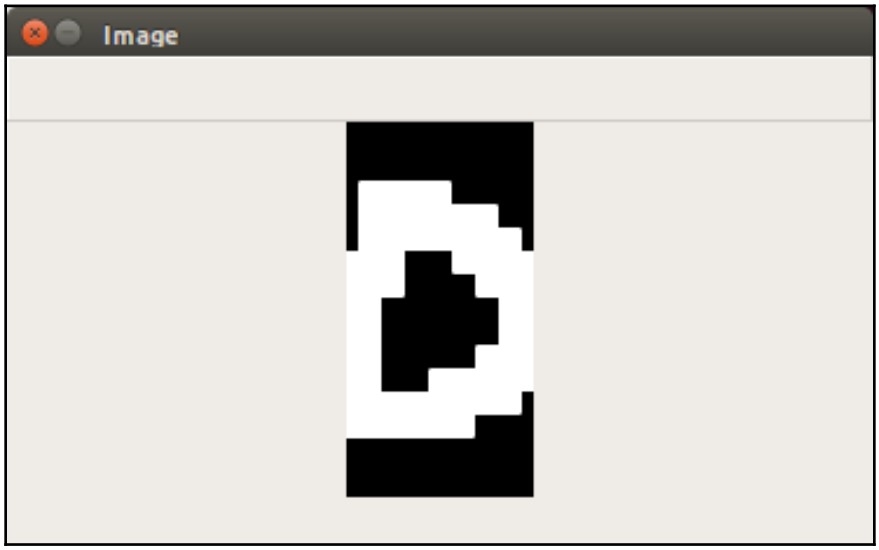

Sign Up
For a free Developer Account
Looking for Commercial Service?
Username
only letters, numbers and underscores
Username
Email
Email
Password
Password


Development Devices
Prototype, experiment, research. more
Add Device


API Keys
Auto-generated MyDevice device key for feed 399948883
CcRxJbP5TuHp1PiOGVrN2kTGeXVsb6QZRJU236v6PjOdtzze
permissions READ,UPDATE,CREATE,DELETE
private accesss

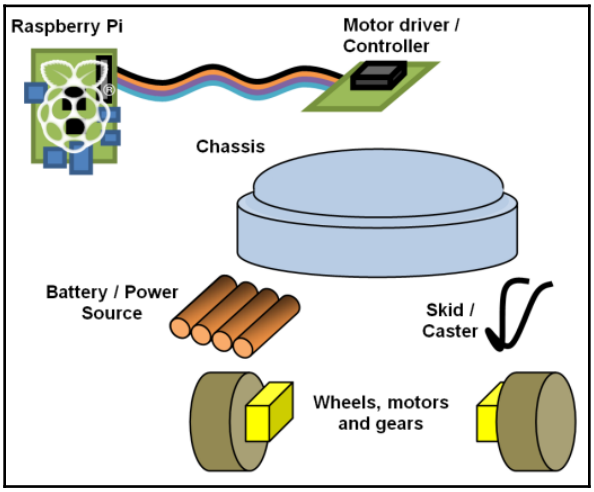
Chapter 11: Building Neural Network Modules for Optical Character Recognition

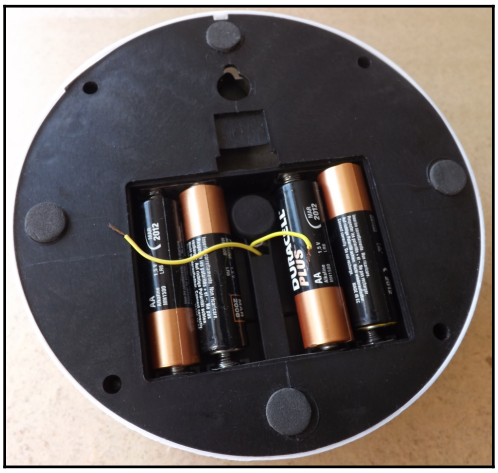
```
manju@manju-HP-Notebook:~/Documents$ python visualize_characters.py
```

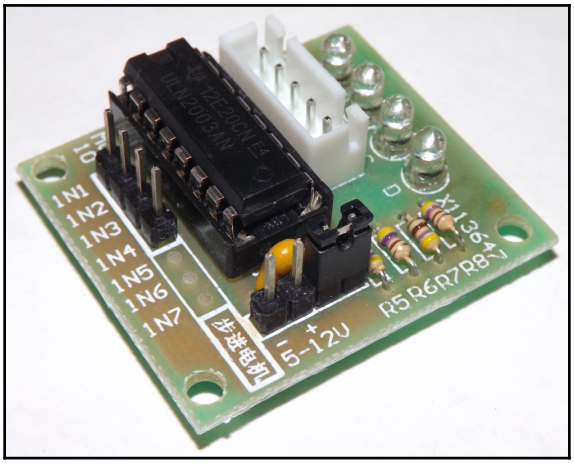


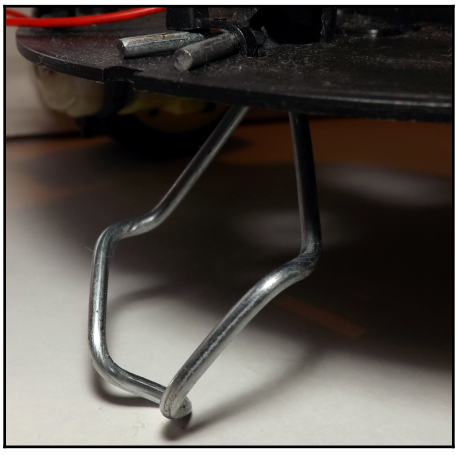
```
manju@manju-HP-Notebook:~/Documents$ python optical_charecter_recognition.py
Epoch: 100; Error: 7.872634174;
Epoch: 200; Error: 6.9598487099;
Epoch: 300; Error: 3.69162674976;
Epoch: 400; Error: 1.28277091966;
Epoch: 500; Error: 1.46603655023;
Epoch: 600; Error: 1.14465834785;
Epoch: 700; Error: 1.54577830363;
Epoch: 800; Error: 0.739356427701;
Epoch: 900; Error: 0.997718413015;
Epoch: 1000; Error: 0.496692038186;
Epoch: 1100; Error: 0.445750401977;
Epoch: 1200; Error: 0.433701255714;
Epoch: 1300; Error: 0.139799043752;
Epoch: 1400; Error: 0.162959312047;
Epoch: 1500; Error: 0.0415268342145;
Epoch: 1600; Error: 0.0218423266053;
Epoch: 1700; Error: 0.0242494495199;
Epoch: 1800; Error: 0.0335171101107;
Epoch: 1900; Error: 0.0211101742172;
Epoch: 2000; Error: 0.013270542884;
Epoch: 2100; Error: 0.0107846817182;
Epoch: 2200; Error: 0.0114038385711;
Epoch: 2300; Error: 0.0136432946878;
Epoch: 2400; Error: 0.0142994078988;
Epoch: 2500; Error: 0.0125231282293;
Epoch: 2600; Error: 0.0112677556235;
Epoch: 2700; Error: 0.0182870005799;
Epoch: 2800; Error: 0.0223704819025;
Epoch: 2900; Error: 0.0109798464676;
The goal of learning is reached

Testing on unknown data:

Original: o
Predicted: o

Original: m
Predicted: n
```

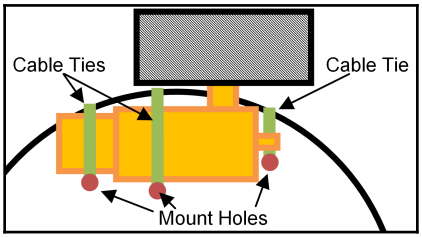
Chapter 12: Building Robots

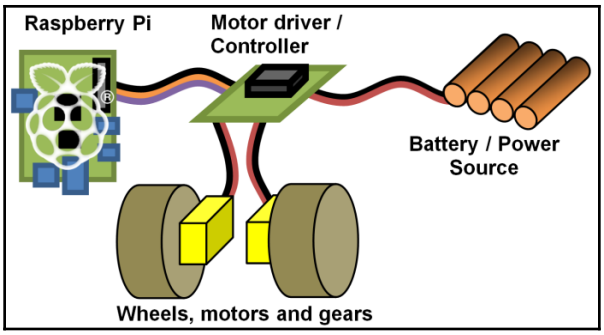


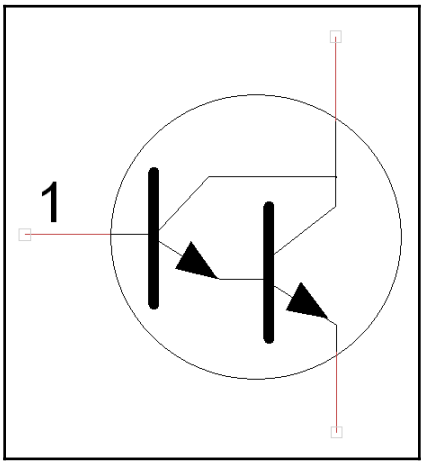


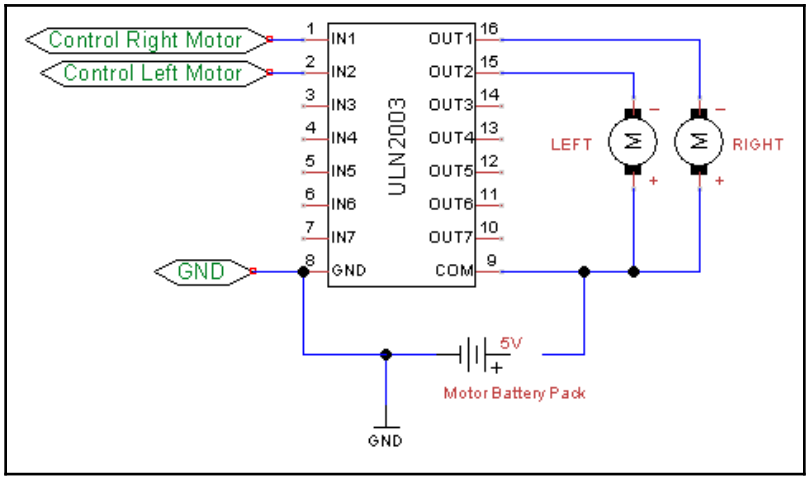

ULN2003AN
1N1
1N2
1N3
1N4
1N5
1N6
1N7
步进电机
5-12V
R5R6R7R8

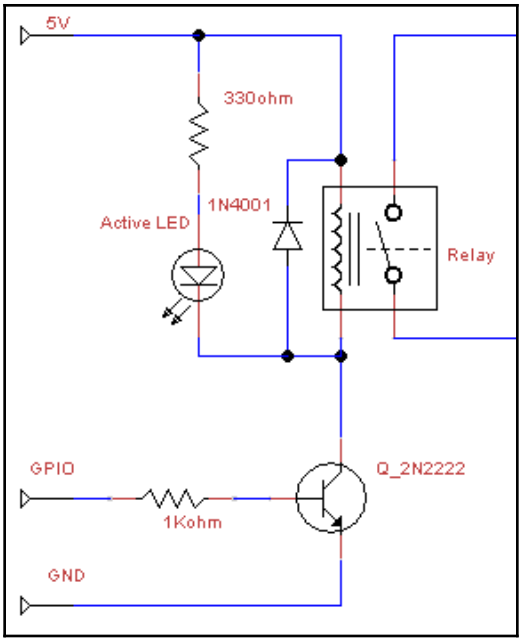


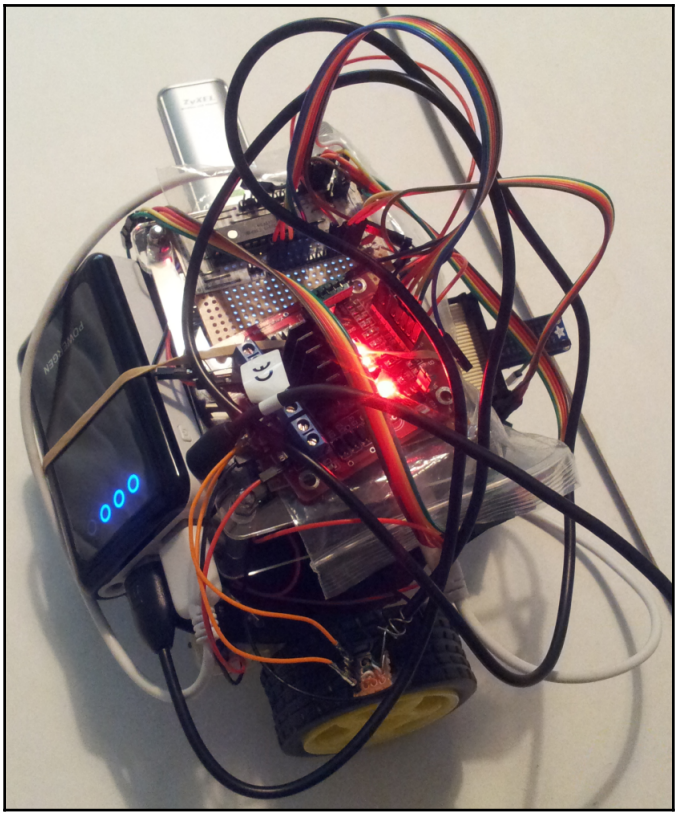

Cable Ties
Cable Tie
Mount Holes

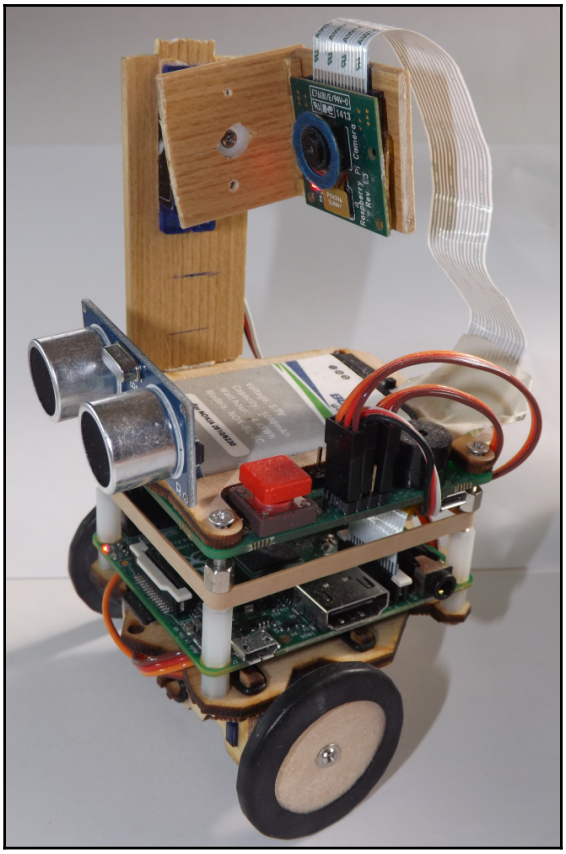

Raspberry Pi
Motor driver /
Controller
Battery / Power
Source
Wheels, motors and gears

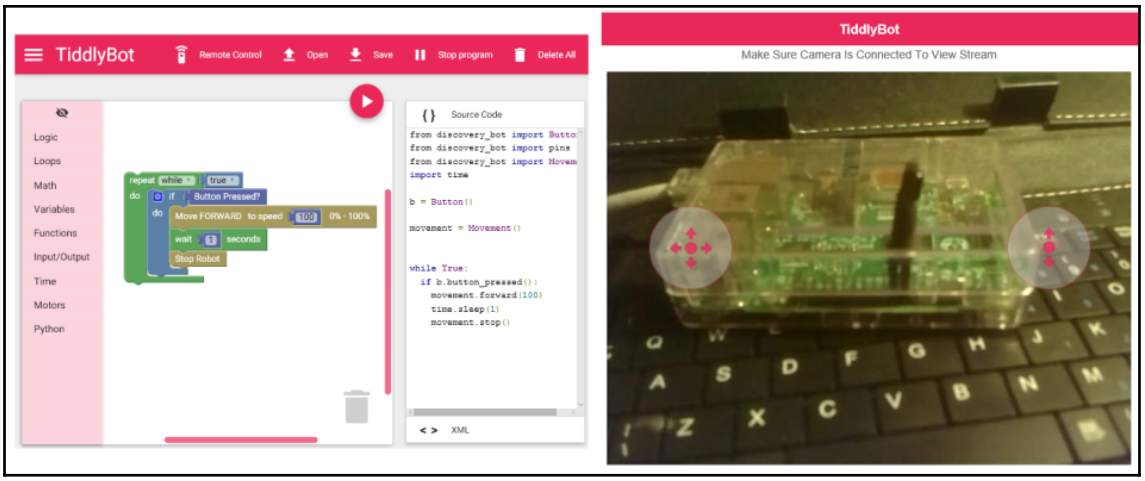

1

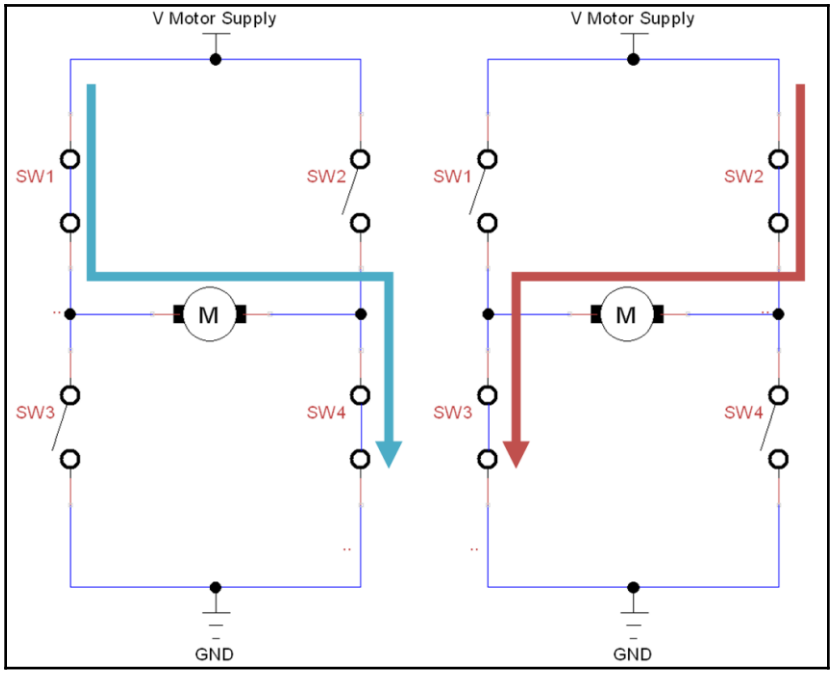

Control Right Motor
Control Left Motor
GND
1
2
3
4
5
6
7
8
IN1
IN2
IN3
IN4
IN5
IN6
IN7
GND
ULN2003
OUT1
OUT2
OUT3
OUT4
OUT5
OUT6
OUT7
COM
16
15
14
13
12
11
10
9
LEFT
RIGHT
M
5V
Motor Battery Pack
GND

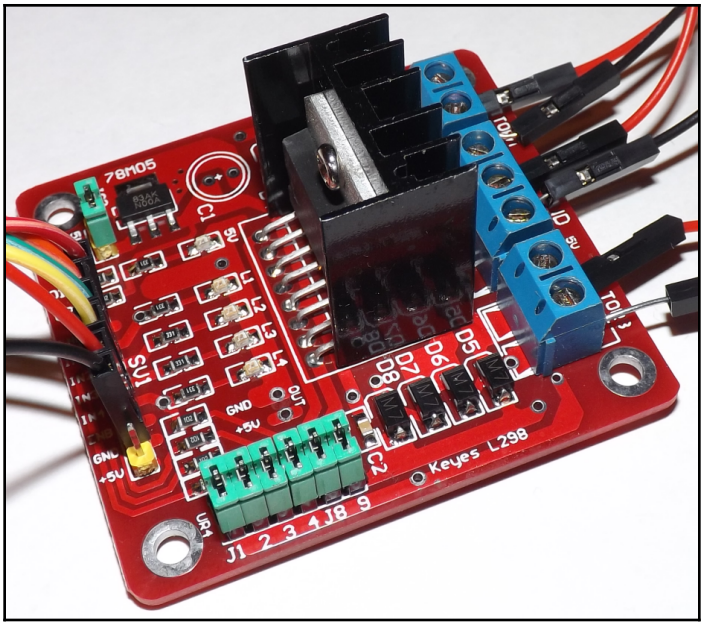

5V
330ohm
1N4001
Active LED
Relay
GPIO
1Kohm
Q_2N2222
GND

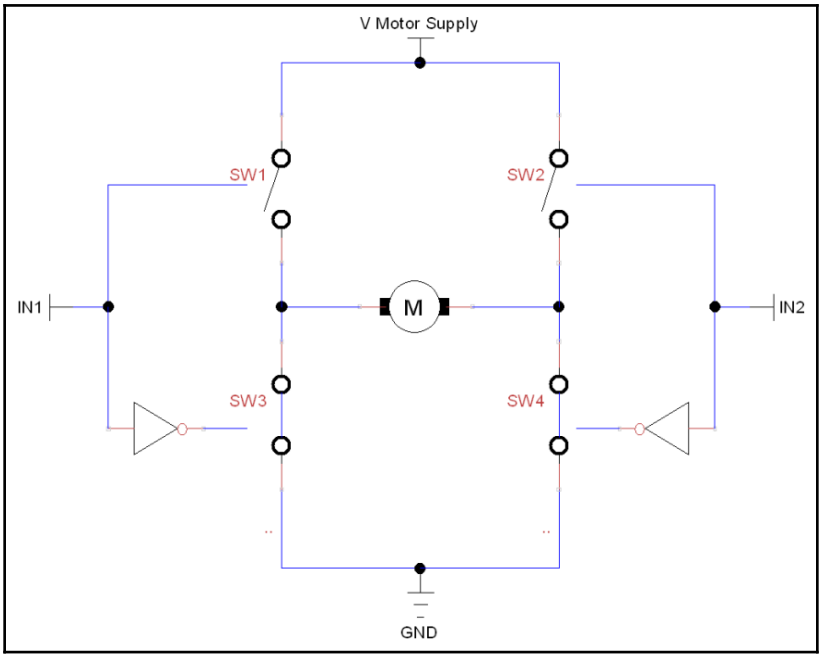


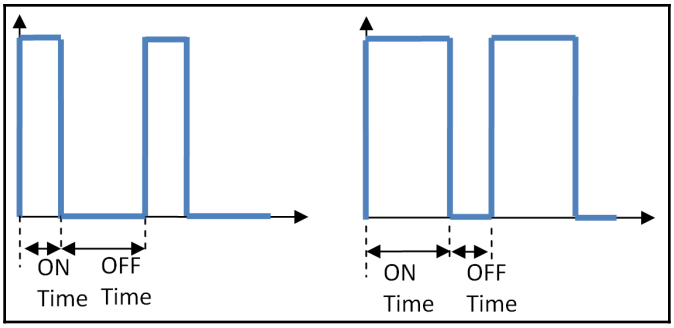


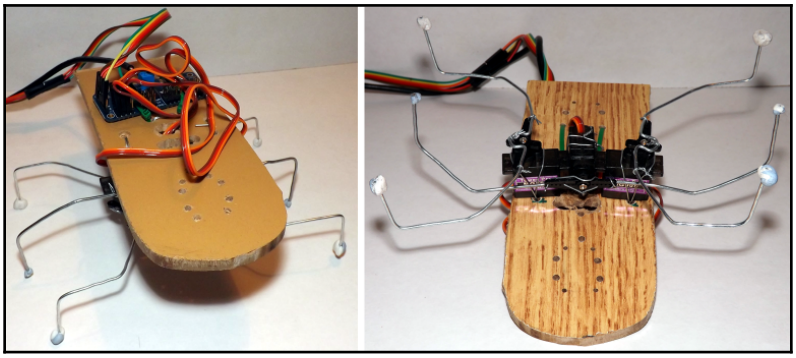

TiddlyBot
Remote Control
Open
Save
Stop program
Delete All
Logic
Loops
Math
Variables
Functions
Input/Output
Time
Motors
Python
repeat while true
do if Button Pressed?
do Move FORWARD to speed 100 0% - 100%
wait 1 seconds
Stop Robot
Source Code
from discovery_bot import Butto
from discovery_bot import pins
from discovery_bot import Movem
import time
b = Button()
movement = Movement()
while True:
if b.button_pressed():
movement.forward(100)
time.sleep(1)
movement.stop()
< > XML
TiddlyBot
Make Sure Camera Is Connected To View Stream


V Motor Supply
SW1
SW2
M
SW3
SW4
GND
V Motor Supply
SW1
SW2
M
SW3
SW4
GND

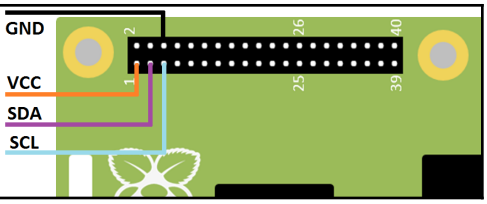

78M05
Keyes L298
J1 2 3 4 J8 9

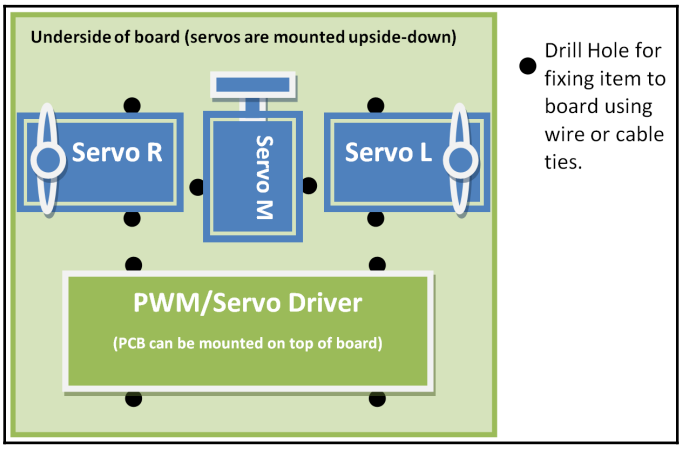

V Motor Supply
SW1
SW2
IN1
M
IN2
SW3
SW4
GND

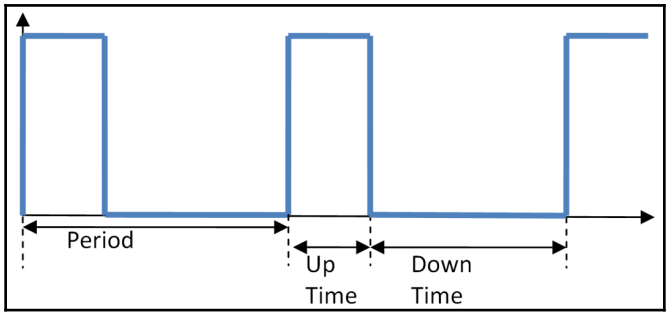

ON
Time
OFF
Time
ON
Time
OFF
Time

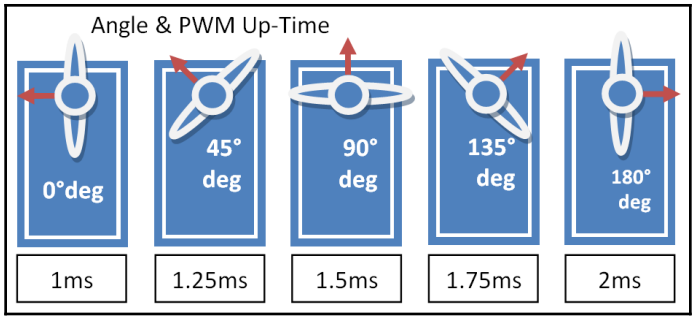


I²C Device	Raspberry Pi GPIO		I²C Device
VCC	1	2	
SDA	3	4	
SCL	5	6	GND

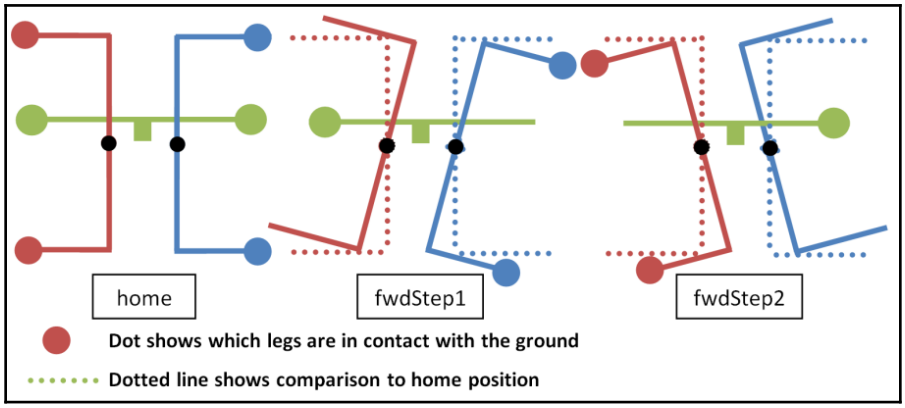


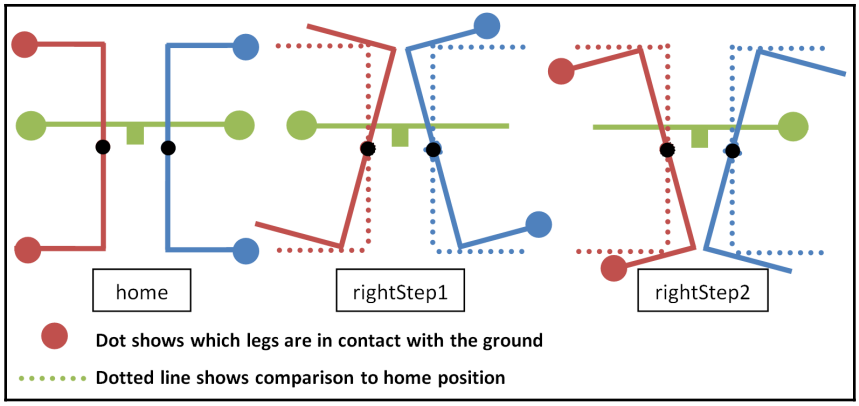


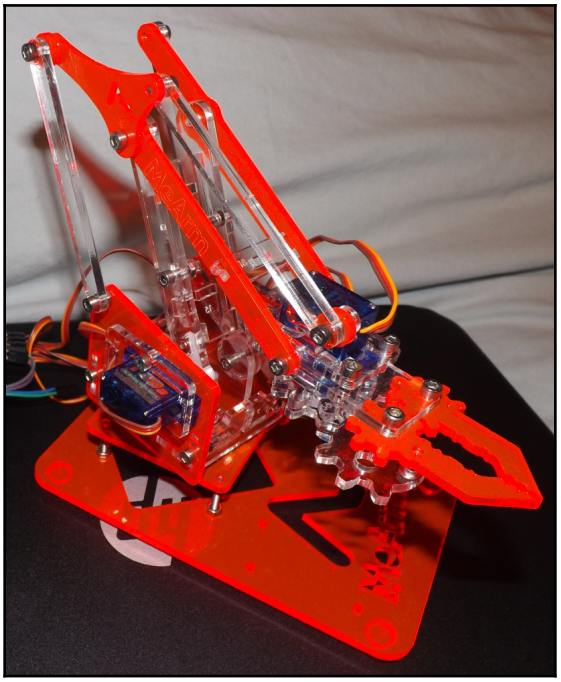




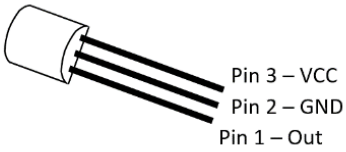
$$\text{prescale} = \left(\frac{25\text{MHz}}{12\text{-bit X pwmFreq}}\right) + 0.5$$


home
fwdStep1
fwdStep2
Dot shows which legs are in contact with the ground
Dotted line shows comparison to home position

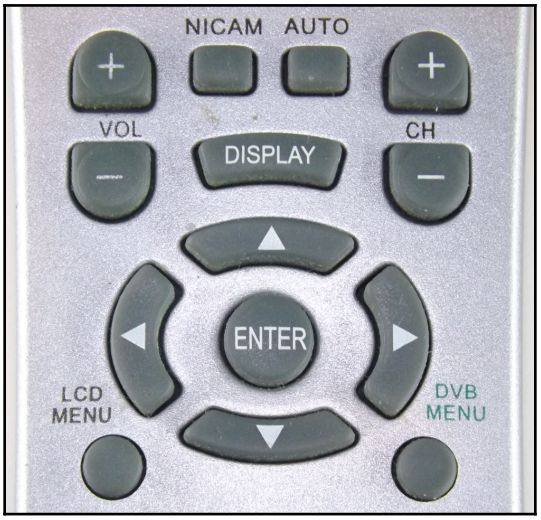

home
rightStep1
rightStep2
Dot shows which legs are in contact with the ground
Dotted line shows comparison to home position



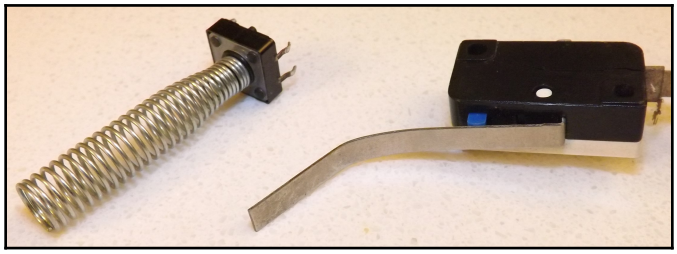
	Servo 0	Servo 1	Servo 2	Servo 3
Function	Turn/Base	Shoulder	Elbow	Claw
Action	Turn left/right	Forward & back	Arm up & down	Open & close
Arm Position at mid-point (90 degrees)				

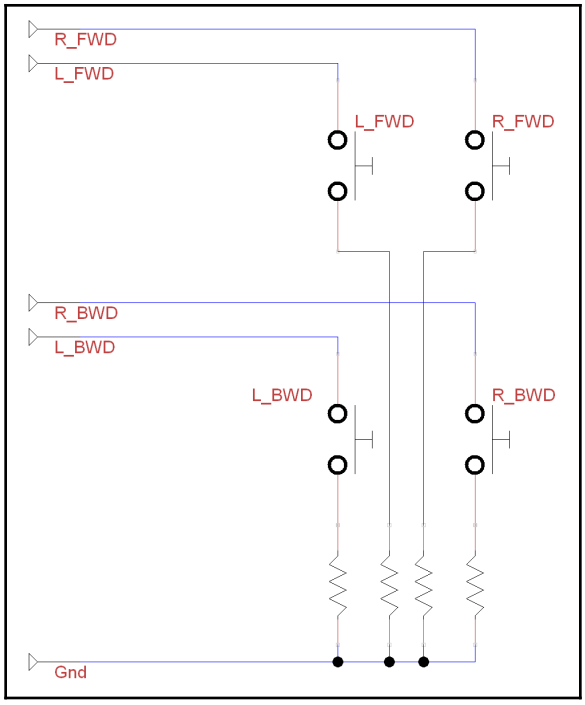


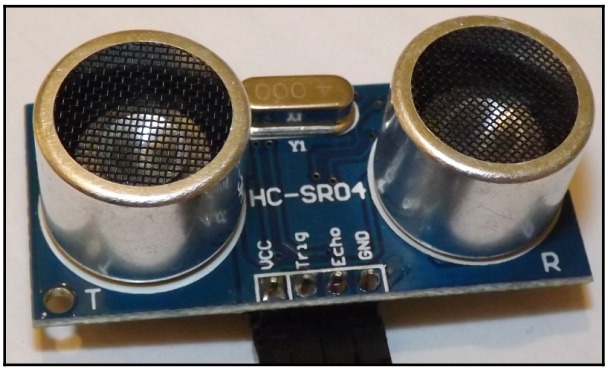
IR Device	Raspberry Pi GPIO Pins				IR Device
Pin 3 – VCC	3V3	17	18	BCM GPIO24	Pin 1 – Out
	N/C	19	20	GND	Pin 2 – GND

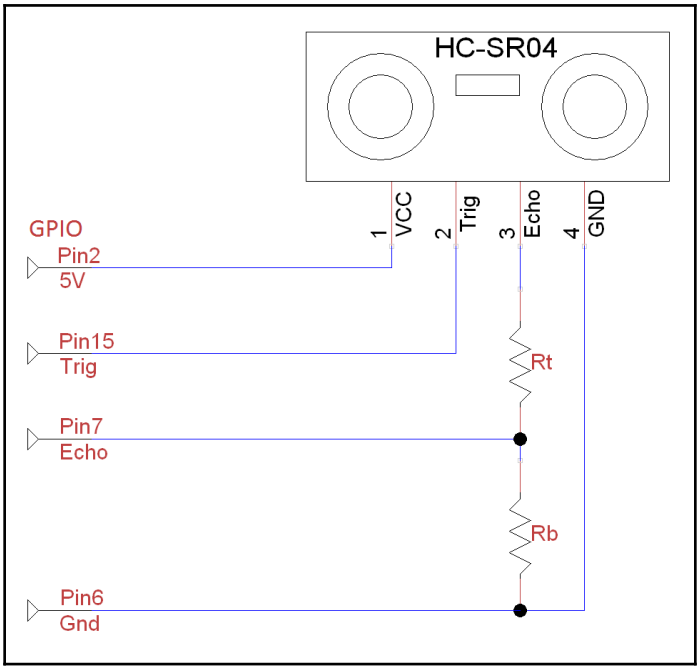



```
Press RETURN to continue.


Now start pressing buttons on your remote control.

It is very important that you press many different buttons and hold them
down for approximately one second. Each button should generate at least one
dot but in no case more than ten dots of output.
Don't stop pressing buttons until two lines of dots (2x80) have been
generated.

Press RETURN now to start recording.
................................................................................
Found const length: 108386
Please keep on pressing buttons like described above.
................................................................................
Space/pulse encoded remote control found.
Signal length is 67.
Found possible header: 9066 4479
Found trail pulse: 594
Found repeat code: 9064 2227
Signals are space encoded.
Signal length is 32
Now enter the names for the buttons.

Please enter the name for the next button (press <ENTER> to finish recording)
KEY_UP

Now hold down button "KEY_UP".

Please enter the name for the next button (press <ENTER> to finish recording)
KEY_DOWN
...
```



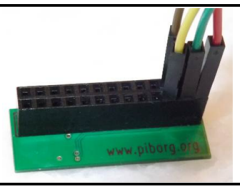

R_FWD
L_FWD
L_FWD
R_FWD
R_BWD
L_BWD
L_BWD
R_BWD
Gnd


HC-SR04
VCC
Trig
Echo
GND
T
R

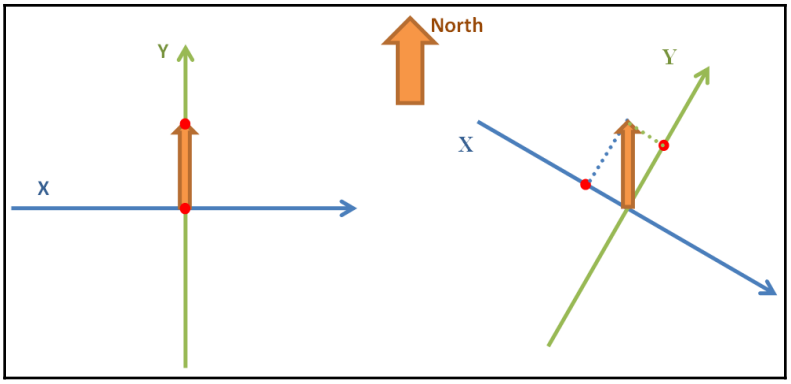


$$V_{out} = \frac{R_t}{(R_t + R_b) \times VCC}$$

I²C Device	Raspberry Pi P1		I²C Device
VCC	1	2	
SDA	3	4	
SCL	5	6	GND



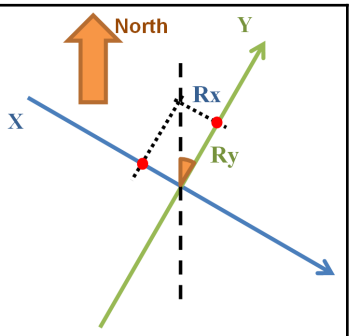
I²C Device	PiBorg TriBorg		I²C Device
	2	1	VCC
	4	3	SDA
GND	6	5	SCL



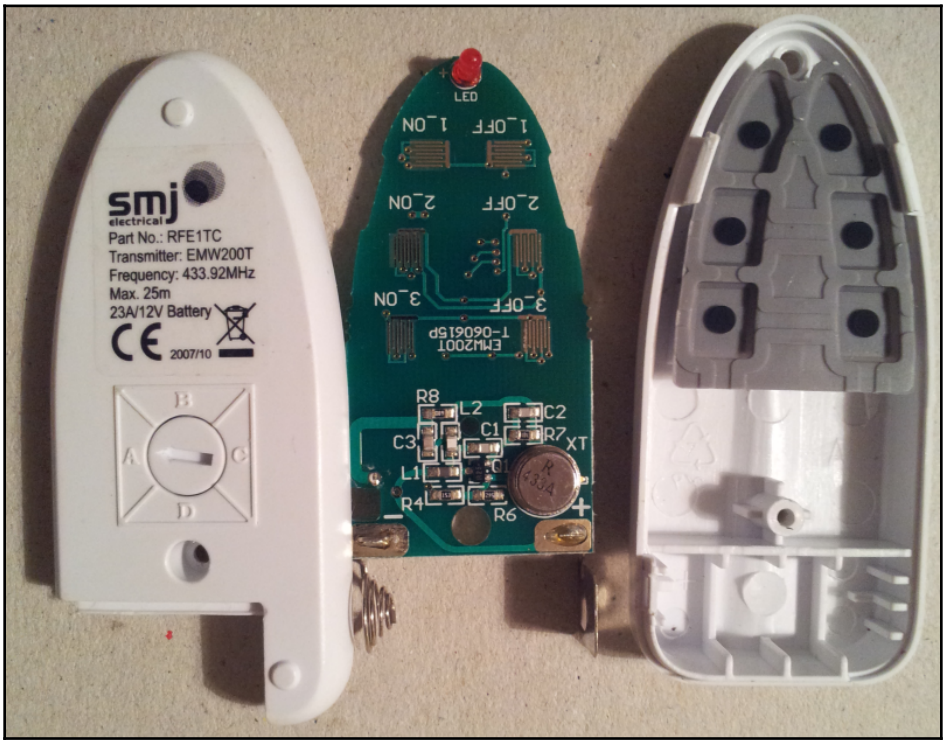
tan (**angle**) = $\frac{Rx}{Ry}$

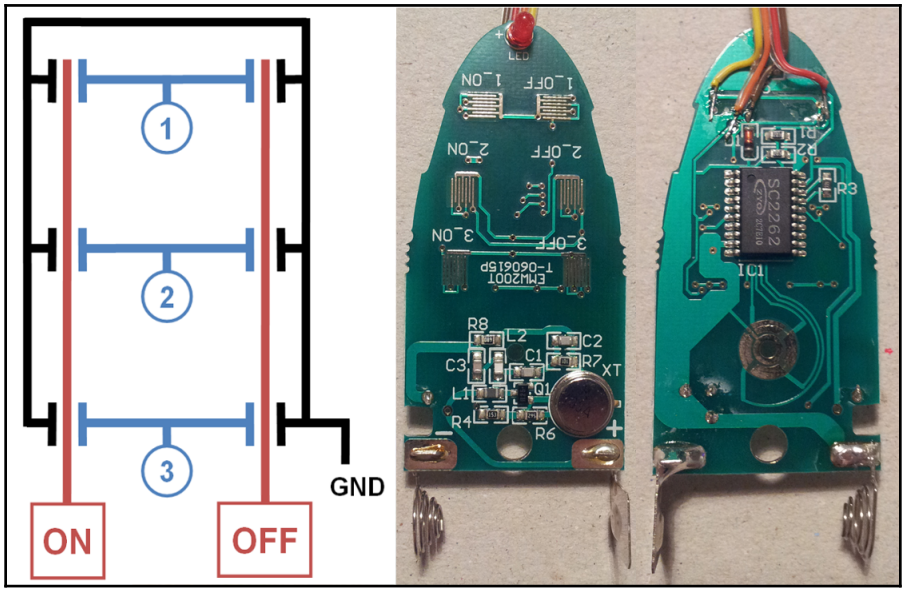
Where:

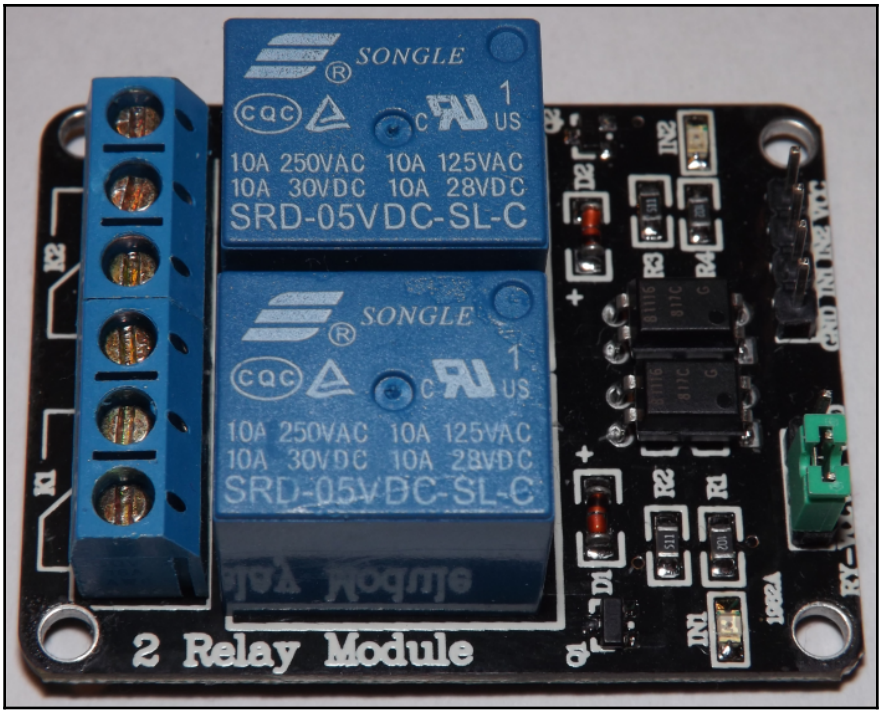
angle = arctan $\left(\frac{Rx}{Ry}\right)$

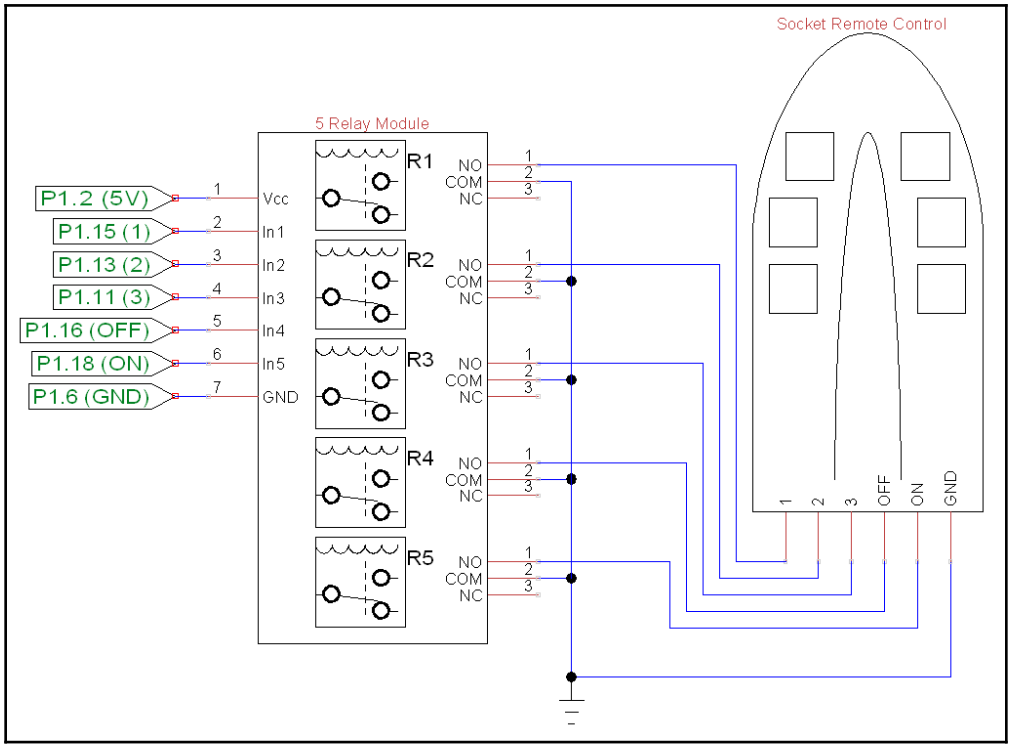


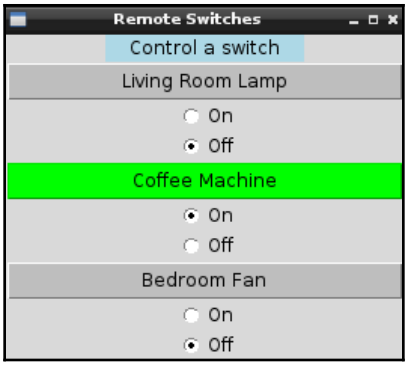
Chapter 13: Interfacing with Technology

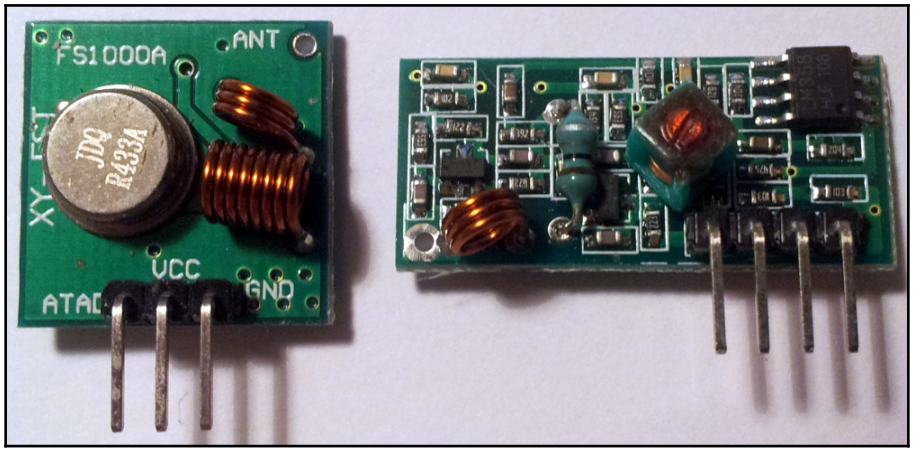


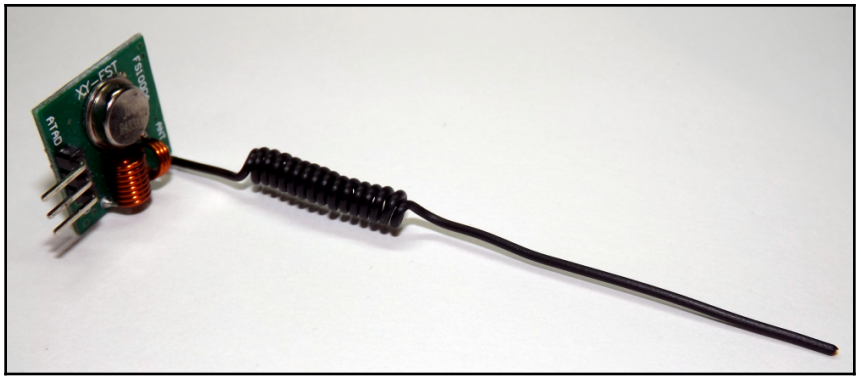

1
2
3
GND
ON
OFF
1_ON
1_OFF
2_ON
2_OFF
3_ON
3_OFF
LED
R8
L2
C2
C1
C3
R7
XT
L1
Q1
R4
R6
IC1
R3

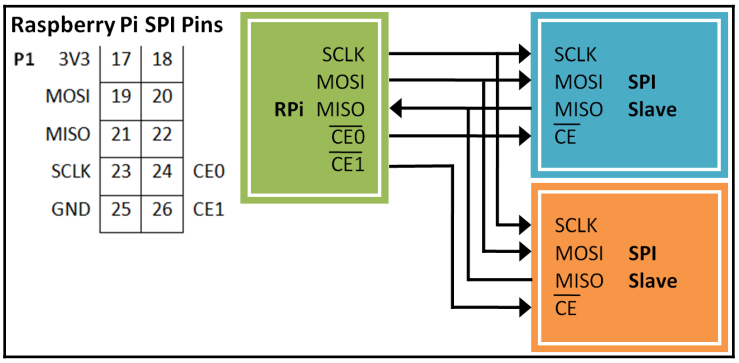

SONGLE
10A 250VAC 10A 125VAC
10A 30VDC 10A 28VDC
SRD-05VDC-SL-C
SONGLE
10A 250VAC 10A 125VAC
10A 30VDC 10A 28VDC
SRD-05VDC-SL-C
2 Relay Module

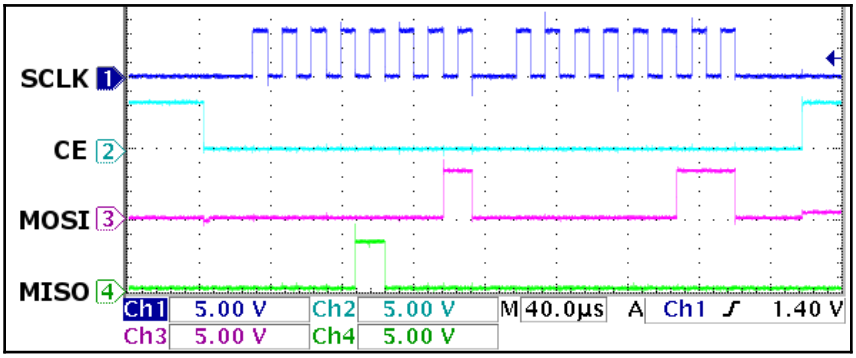

Socket Remote Control
5 Relay Module
P1.2 (5V)
P1.15 (1)
P1.13 (2)
P1.11 (3)
P1.16 (OFF)
P1.18 (ON)
P1.6 (GND)
Vcc
In1
In2
In3
In4
In5
GND
R1
R2
R3
R4
R5
NO
COM
NC
OFF
ON
GND

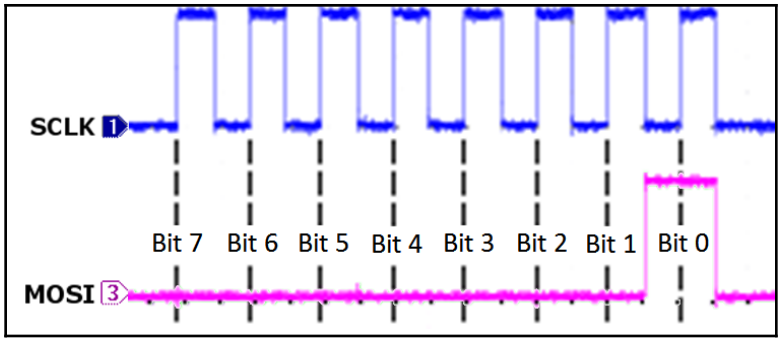

Remote Switches
Control a switch
Living Room Lamp
On
Off
Coffee Machine
On
Off
Bedroom Fan
On
Off

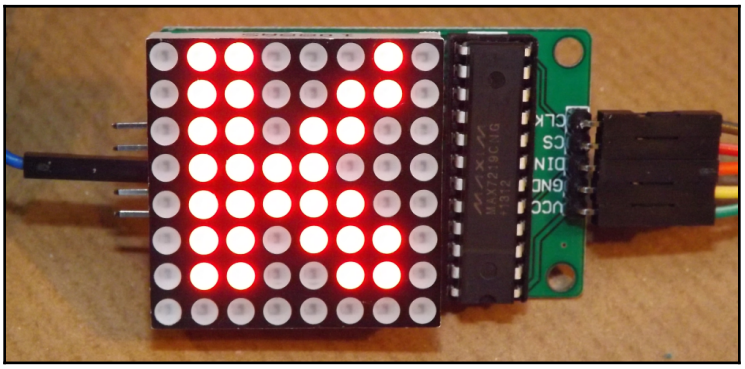

FS1000A
ANT
XY-FST
JDQ
R433A
VCC
GND
ATAD



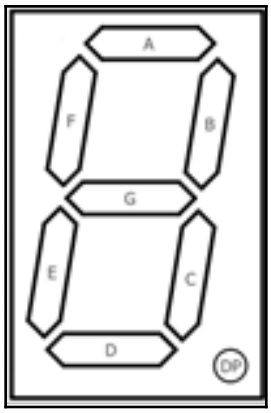

Raspberry Pi SPI Pins
P1
3V3 17 18
MOSI 19 20
MISO 21 22
SCLK 23 24 CE0
GND 25 26 CE1
RPi
SCLK
MOSI
MISO
CE0
CE1
SCLK
MOSI
MISO
CE
SPI
Slave
SCLK
MOSI
MISO
CE
SPI
Slave

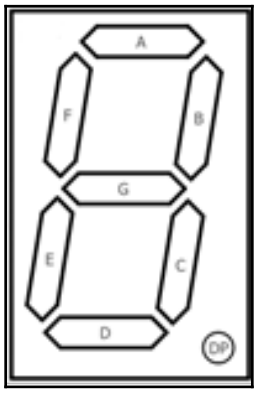

SCLK 1
CE 2
MOSI 3
MISO 4
Ch1 5.00 V
Ch2 5.00 V
M 40.0µs
A Ch1 1.40 V
Ch3 5.00 V
Ch4 5.00 V

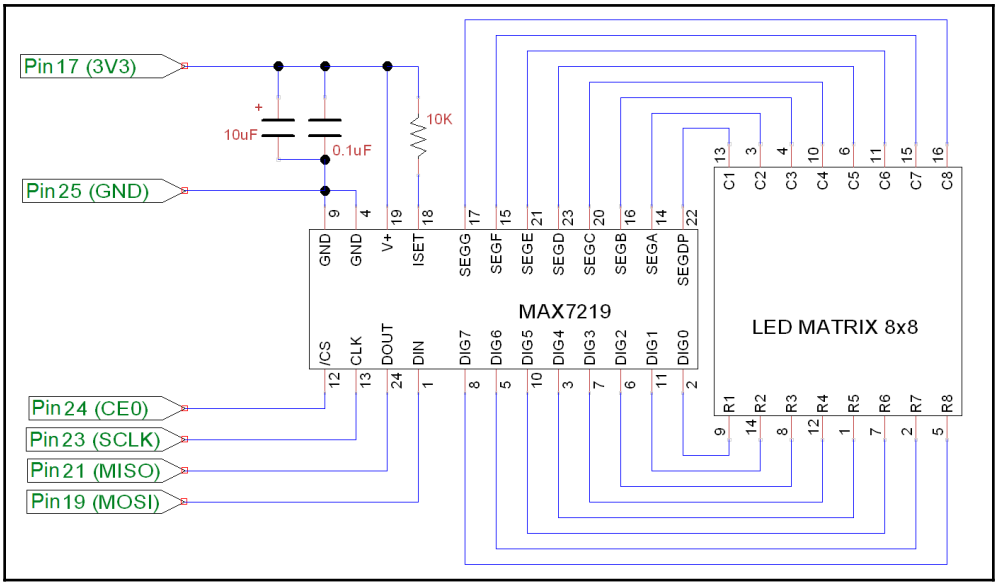

SCLK 1
Bit 7
Bit 6
Bit 5
Bit 4
Bit 3
Bit 2
Bit 1
Bit 0
MOSI 3

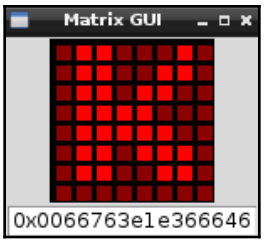


GPIO	3V3	17	18	
	MOSI	19	20	
	MISO	21	22	
	SCLK	23	24	CE0
	GND	25	26	CE1

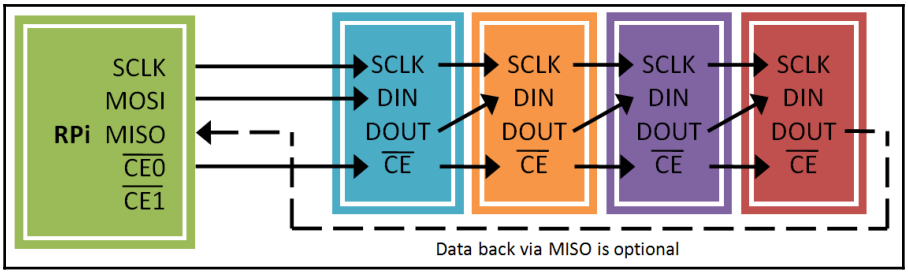


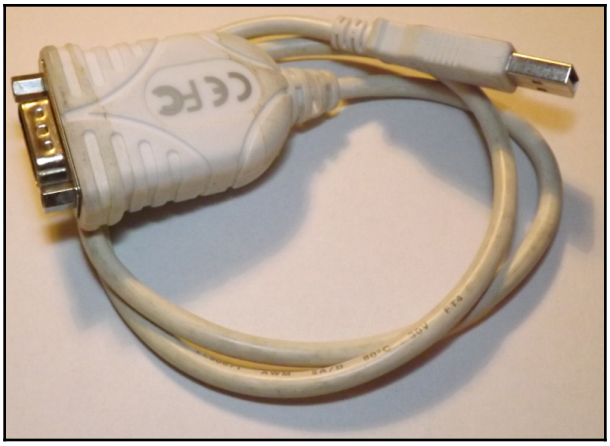


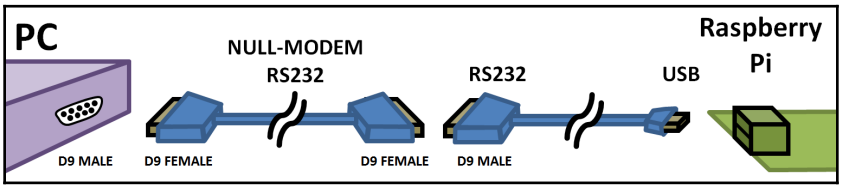


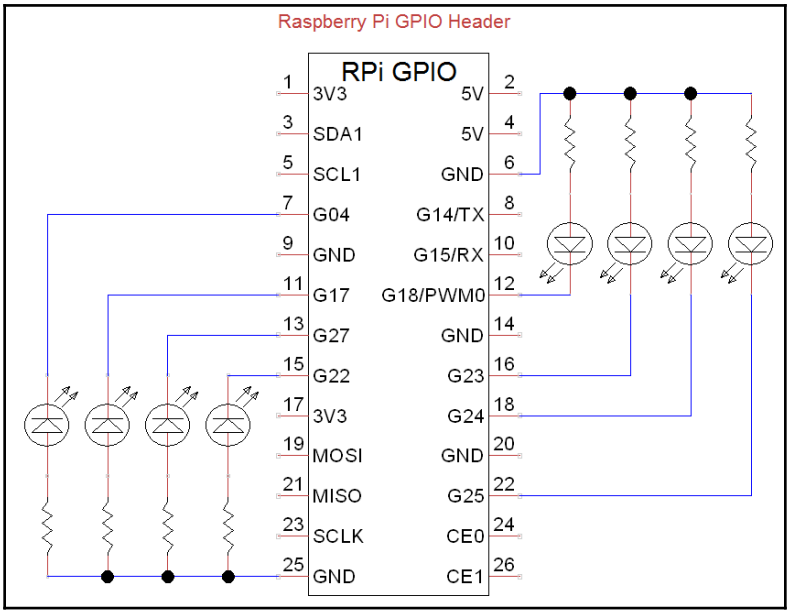


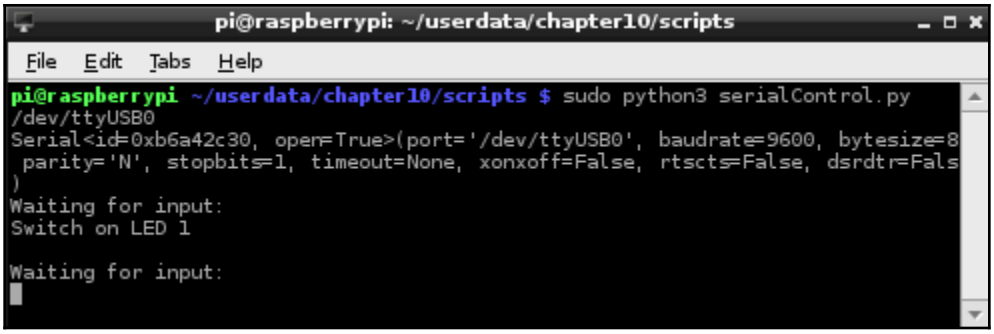
	Bits LSB to MSB								
	0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	
DIG7	0	1	1	0	0	0	1	0	**0x46**
DIG6	0	1	1	0	0	1	1	0	**0x66**
DIG5	0	1	1	0	1	1	0	0	**0x36**
DIG4	0	1	1	1	1	0	0	0	**0x1e**
DIG3	0	1	1	1	1	1	0	0	**0x3e**
DIG2	0	1	1	0	1	1	1	0	**0x76**
DIG1	0	1	1	0	0	1	1	0	**0x66**
DIG0	0	0	0	0	0	0	0	0	**0x00**

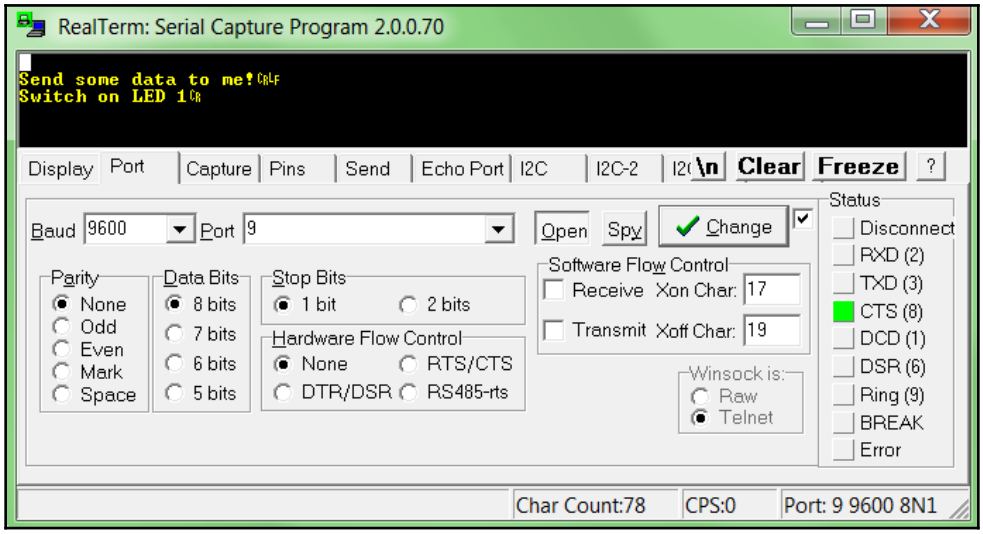

SCLK
MOSI
RPi MISO
CE0
CE1
SCLK
DIN
DOUT
CE
SCLK
DIN
DOUT
CE
SCLK
DIN
DOUT
CE
SCLK
DIN
DOUT
CE
Data back via MISO is optional

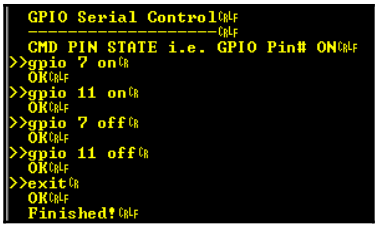


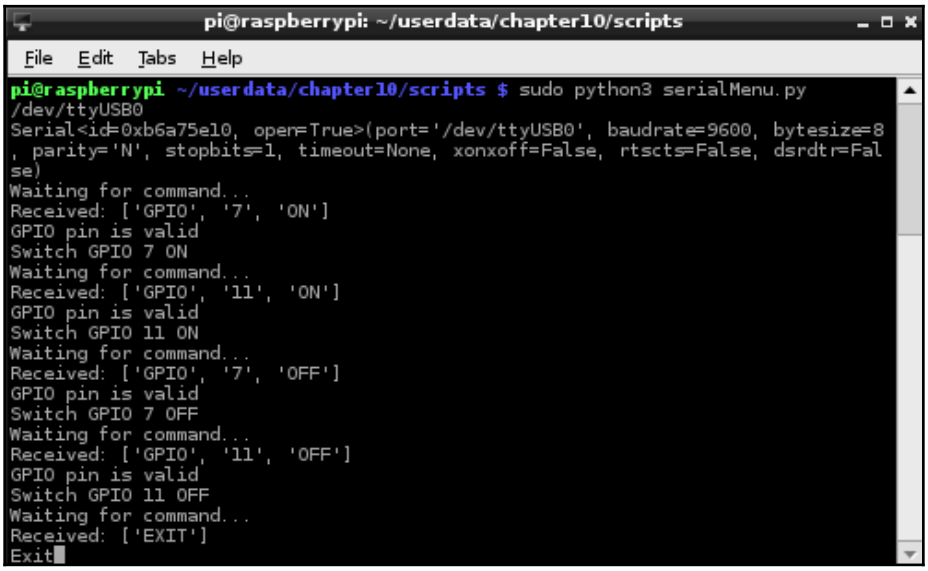

PC
NULL-MODEM
RS232
RS232
USB
Raspberry
Pi
D9 MALE
D9 FEMALE
D9 FEMALE
D9 MALE


Raspberry Pi GPIO Header
RPi GPIO
1 3V3
2 5V
3 SDA1
4 5V
5 SCL1
6 GND
7 G04
8 G14/TX
9 GND
10 G15/RX
11 G17
12 G18/PWM0
13 G27
14 GND
15 G22
16 G23
17 3V3
18 G24
19 MOSI
20 GND
21 MISO
22 G25
23 SCLK
24 CE0
25 GND
26 CE1

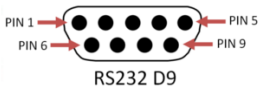

pi@raspberrypi: ~/userdata/chapter10/scripts
File Edit Tabs Help
pi@raspberrypi ~/userdata/chapter10/scripts $ sudo python3 serialControl.py
/dev/ttyUSB0
Serial<id=0xb6a42c30, open=True>(port='/dev/ttyUSB0', baudrate=9600, bytesize=8
parity='N', stopbits=1, timeout=None, xonxoff=False, rtscts=False, dsrdtr=Fals
)
Waiting for input:
Switch on LED 1
Waiting for input:


RealTerm: Serial Capture Program 2.0.0.70
Send some data to me!
Switch on LED 1
Display
Port
Capture
Pins
Send
Echo Port
I2C
I2C-2
\n
Clear
Freeze
?
Baud 9600
Port 9
Open
Spy
Change
Status
Disconnect
RXD (2)
TXD (3)
CTS (8)
DCD (1)
DSR (6)
Ring (9)
BREAK
Error
Parity
None
Odd
Even
Mark
Space
Data Bits
8 bits
7 bits
6 bits
5 bits
Stop Bits
1 bit
2 bits
Hardware Flow Control
None
RTS/CTS
DTR/DSR
RS485-rts
Software Flow Control
Receive Xon Char: 17
Transmit Xoff Char: 19
Winsock is:
Raw
Telnet
Char Count:78
CPS:0
Port: 9 9600 8N1


GPIO Serial Control
CMD PIN STATE i.e. GPIO Pin# ON
>>gpio 7 on
OK
>>gpio 11 on
OK
>>gpio 7 off
OK
>>gpio 11 off
OK
>>exit
OK
Finished!

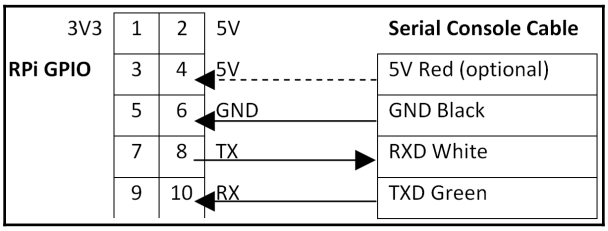

pi@raspberrypi: ~/userdata/chapter10/scripts
File Edit Tabs Help
pi@raspberrypi ~/userdata/chapter10/scripts $ sudo python3 serialMenu.py
/dev/ttyUSB0
Serial<id=0xb6a75e10, open=True>(port='/dev/ttyUSB0', baudrate=9600, bytesize=8, parity='N', stopbits=1, timeout=None, xonxoff=False, rtscts=False, dsrdtr=False)
Waiting for command...
Received: ['GPIO', '7', 'ON']
GPIO pin is valid
Switch GPIO 7 ON
Waiting for command...
Received: ['GPIO', '11', 'ON']
GPIO pin is valid
Switch GPIO 11 ON
Waiting for command...
Received: ['GPIO', '7', 'OFF']
GPIO pin is valid
Switch GPIO 7 OFF
Waiting for command...
Received: ['GPIO', '11', 'OFF']
GPIO pin is valid
Switch GPIO 11 OFF
Waiting for command...
Received: ['EXIT']
Exit

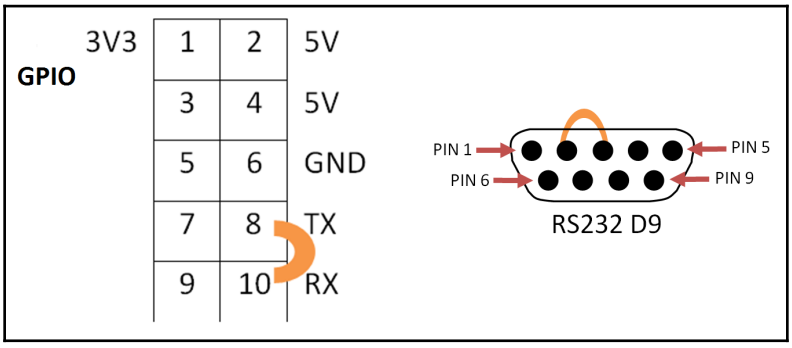
Pin	Signal	
1	Carrier Detector (DCD)	DCD
2	Receive Data (Rx)	RXD
3	Transmit Data (Tx)	TXD
4	Data Terminal Ready	DTR
5	Signal Ground (SG)	GND

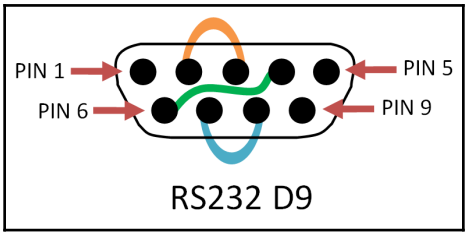


RS232 D9

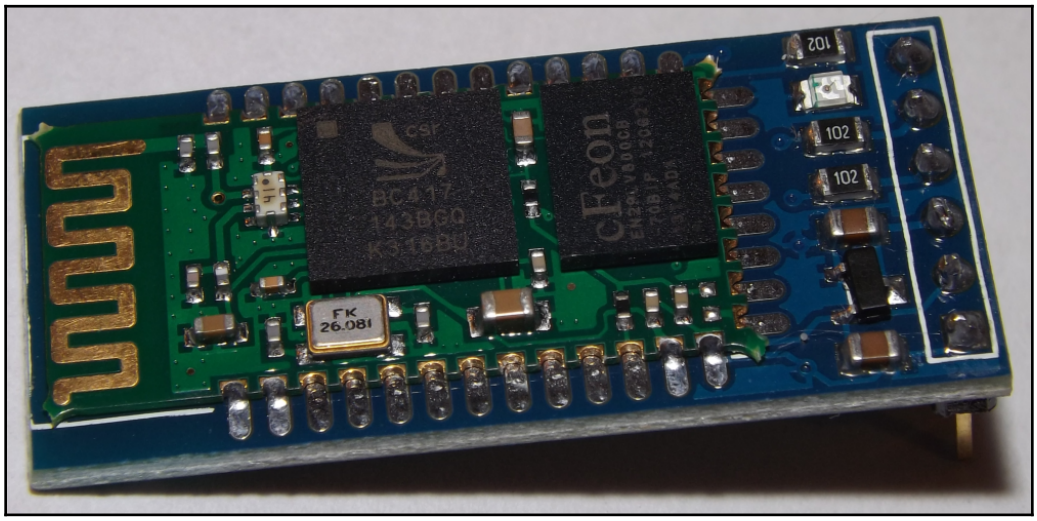
Pin	Signal	
6	Data Set Ready	DSR
7	Request to Send	RTS
8	Clear to Send	CTS
9	Ring Indicator	RI

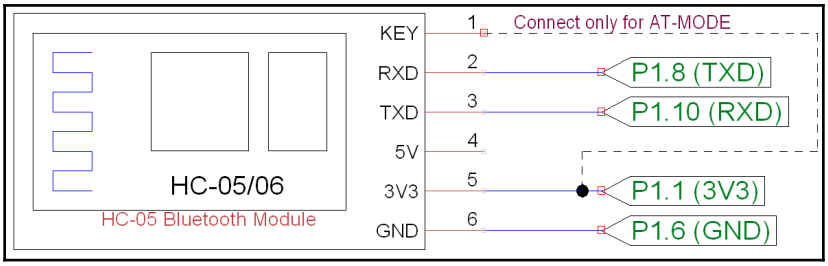


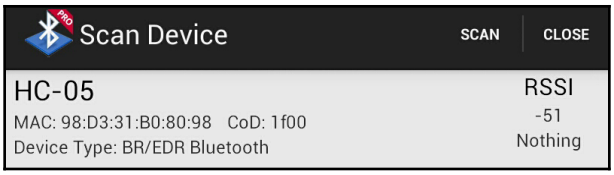


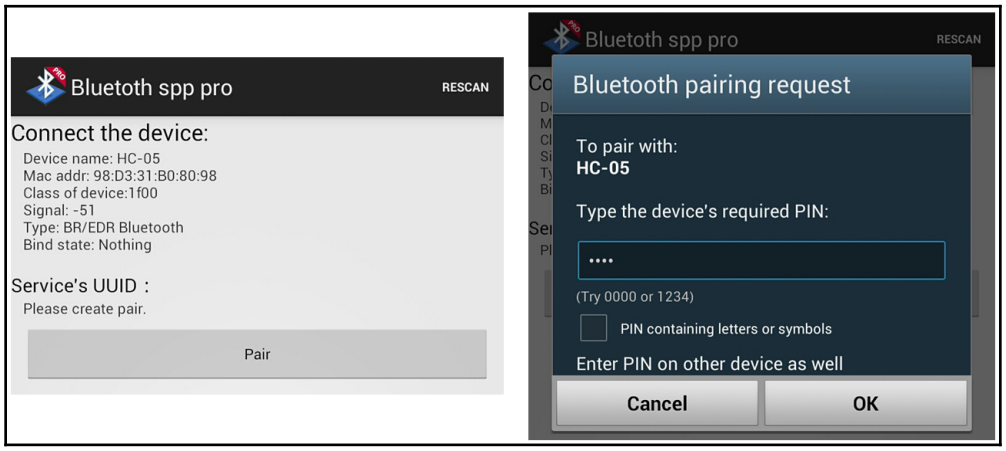


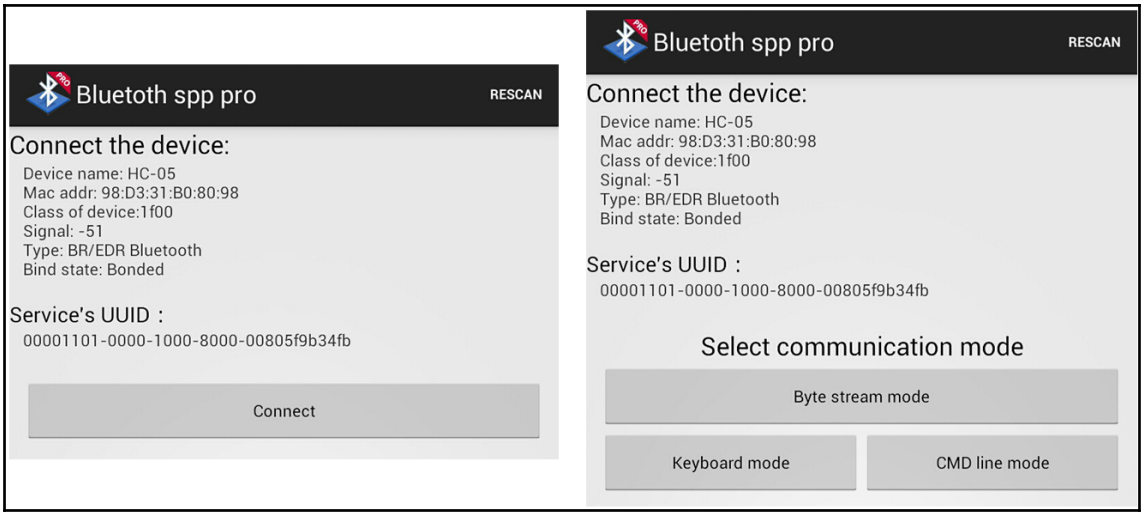

```
pi@raspberrypi: ~/userdata/chapter10/scripts
File  Edit  Tabs  Help
pi@raspberrypi ~/userdata/chapter10/scripts $ sudo python3 serialTest.py
/dev/ttyAMA0
Serial<id=0xb6a3a510, open=True>(port='/dev/ttyAMA0', baudrate=9600, bytesize=8,
 parity='N', stopbits=1, timeout=None, xonxoff=False, rtscts=False, dsrdtr=False
)
For Serial Loopback - connect P1-Pin8 and P1-Pin10
[Type Message and Press Enter to continue]
#:
Hello
>>Hello
```

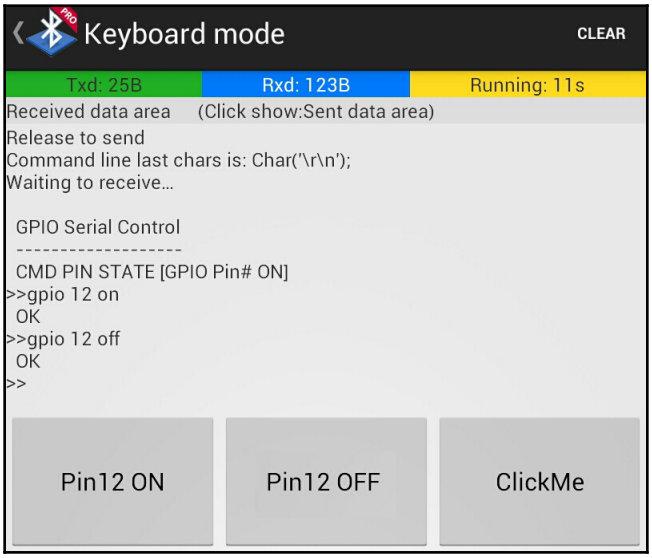



HC-05/06
HC-05 Bluetooth Module
KEY
RXD
TXD
5V
3V3
GND
1
2
3
4
5
6
Connect only for AT-MODE
P1.8 (TXD)
P1.10 (RXD)
P1.1 (3V3)
P1.6 (GND)


Scan Device
SCAN
CLOSE
HC-05
MAC: 98:D3:31:B0:80:98 CoD: 1f00
Device Type: BR/EDR Bluetooth
RSSI
-51
Nothing


Bluetoth spp pro
RESCAN
Connect the device:
Device name: HC-05
Mac addr: 98:D3:31:B0:80:98
Class of device:1f00
Signal: -51
Type: BR/EDR Bluetooth
Bind state: Nothing
Service's UUID :
Please create pair.
Pair
Bluetoth spp pro
RESCAN
Bluetooth pairing request
To pair with:
HC-05
Type the device's required PIN:
(Try 0000 or 1234)
PIN containing letters or symbols
Enter PIN on other device as well
Cancel
OK

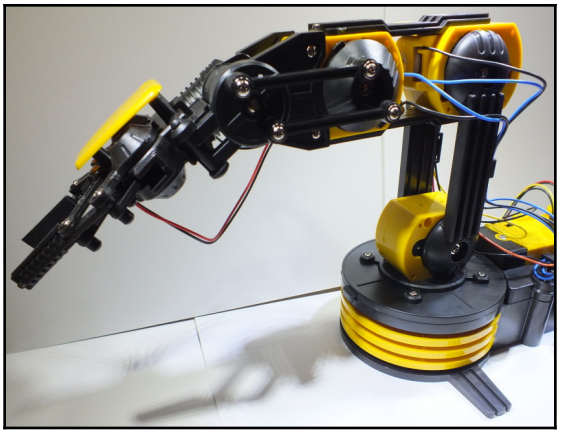

Bluetoth spp pro
RESCAN
Connect the device:
Device name: HC-05
Mac addr: 98:D3:31:B0:80:98
Class of device:1f00
Signal: -51
Type: BR/EDR Bluetooth
Bind state: Bonded
Service's UUID：
00001101-0000-1000-8000-00805f9b34fb
Connect
Bluetoth spp pro
RESCAN
Connect the device:
Device name: HC-05
Mac addr: 98:D3:31:B0:80:98
Class of device:1f00
Signal: -51
Type: BR/EDR Bluetooth
Bind state: Bonded
Service's UUID：
00001101-0000-1000-8000-00805f9b34fb
Select communication mode
Byte stream mode
Keyboard mode
CMD line mode


Keyboard mode
CLEAR
Txd: 25B
Rxd: 123B
Running: 11s
Received data area (Click show:Sent data area)
Release to send
Command line last chars is: Char('\r\n');
Waiting to receive…
GPIO Serial Control
CMD PIN STATE [GPIO Pin# ON]
>>gpio 12 on
OK
>>gpio 12 off
OK
>>
Pin12 ON
Pin12 OFF
ClickMe

```
pi@raspberrypi: ~/userdata/chapter10/scripts
File  Edit  Tabs  Help
pi@raspberrypi ~/userdata/chapter10/scripts $ sudo python3 serialMenu.py
/dev/ttyAMA0
Serial<id=0xb6a15f50, open=True>(port='/dev/ttyAMA0', baudrate=9600, bytesize=8,
 parity='N', stopbits=1, timeout=None, xonxoff=False, rtscts=False, dsrdtr=False
)
Waiting for command...
Received: ['GPIO', '12', 'ON']
GPIO pin is valid
Switch GPIO 12 ON
Waiting for command...
Received: ['GPIO', '12', 'OFF']
GPIO pin is valid
Switch GPIO 12 OFF
Waiting for command...
```

<Param1> Baud Rate (bits/s)									
4800	9600	19200	38400	57600	115200	23400	460800	921600	1382400
<Param2> Stop Bit				0	1 Bit			1	2 Bits
<Param3> Parity Bit				0	None	1	Odd Parity	2	Even Parity


Missile Command
Select action
Up
Left
Fire
Right
Down



Chapter 14: Can I Recommend a Movie for You?

```
manju@manju-HP-Notebook:~/Documents$ python Euclidean_distance.py

Euclidean score:
0.4
```

```
manju@manju-HP-Notebook:~/Documents$ python Pearson_correlation.py

Pearson score:
0.693375245282
```

```
manju@manju-HP-Notebook:~/Documents$ python movie_recommendations.py

Recommendations for Steven Ferndndes:
1. Avengers
2. Dark night
3. Intersteller

Recommendations for Ramesh Nayak:
1. No recommendations possible
manju@manju-HP-Notebook:~/Documents$
```